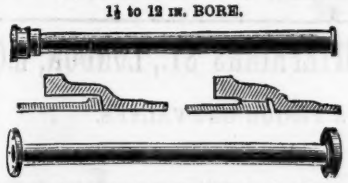
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LVIII. No. 1492.] LONDON, DECEMBER 15, 1891. [43RD YEAR. Price 6d.

GAS AND WATER PIPES.

1¼ to 12 IN. BORE.



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Which has now fully proved itself to be the most effectual, powerful, and perfect Apparatus in the World,
FOR PURIFYING GAS FROM
TAR, CARBONIC ACID, AMMONIA
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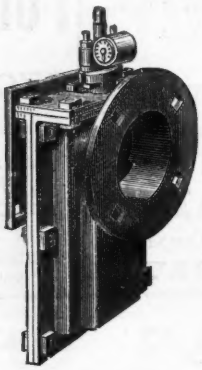

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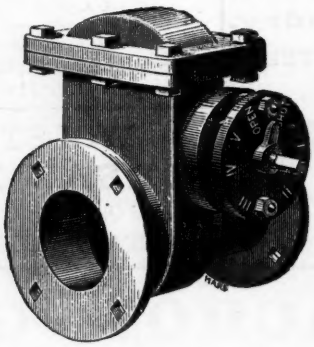

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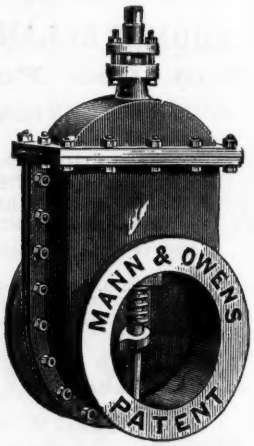

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Also Makers of Pillar Valves, Self-acting Bye-pass Valves, Outside Rack and Pinion Valves, Hydraulic Main-Valves, Disc-Valves, and Special Valves of all kinds. Improved Gas-Exhausters, Steam-Engines, Steam-Cranes, Boilers. Blake's Patent Steam-Pumps for Tar, Water, and Ammoniacal Liquor, Hydraulic Coal-truck Lifts, Hydraulic Cranes, Hydraulic Apparatus for Lifting Purifier-Covers, and every description of Pumping Apparatus, &c., suitable for use in Gas-Works, made to order.

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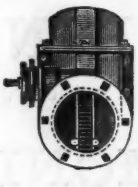
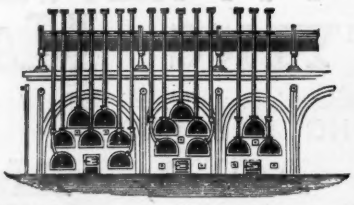
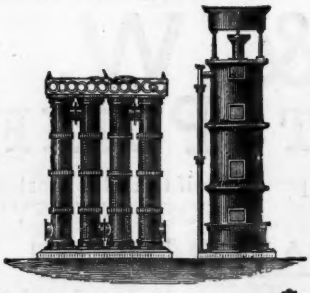
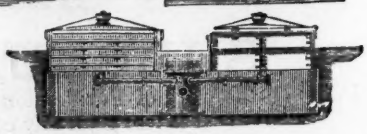
Also Bye-Pass & Stop Valves.









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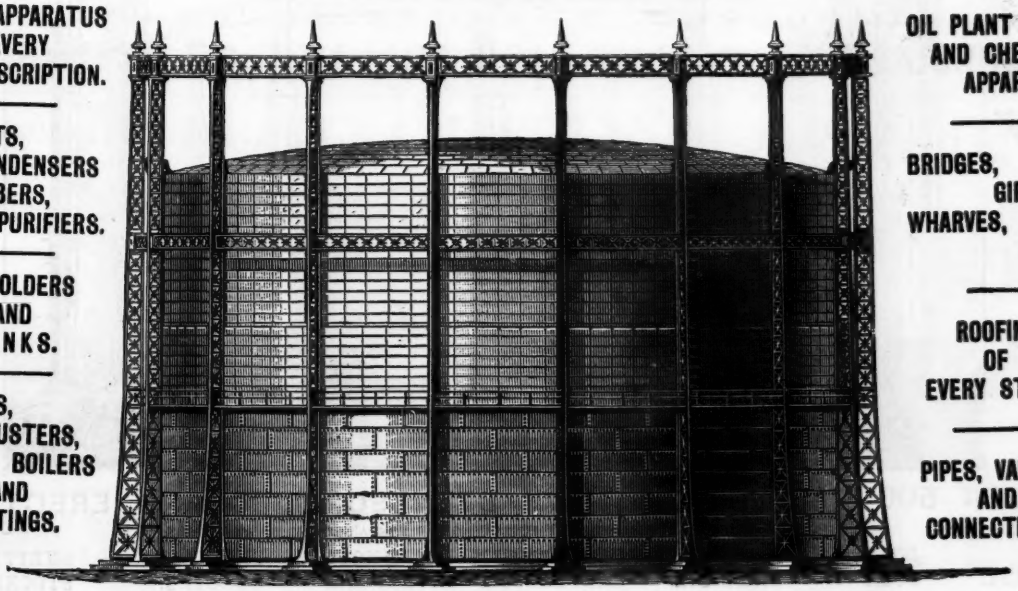

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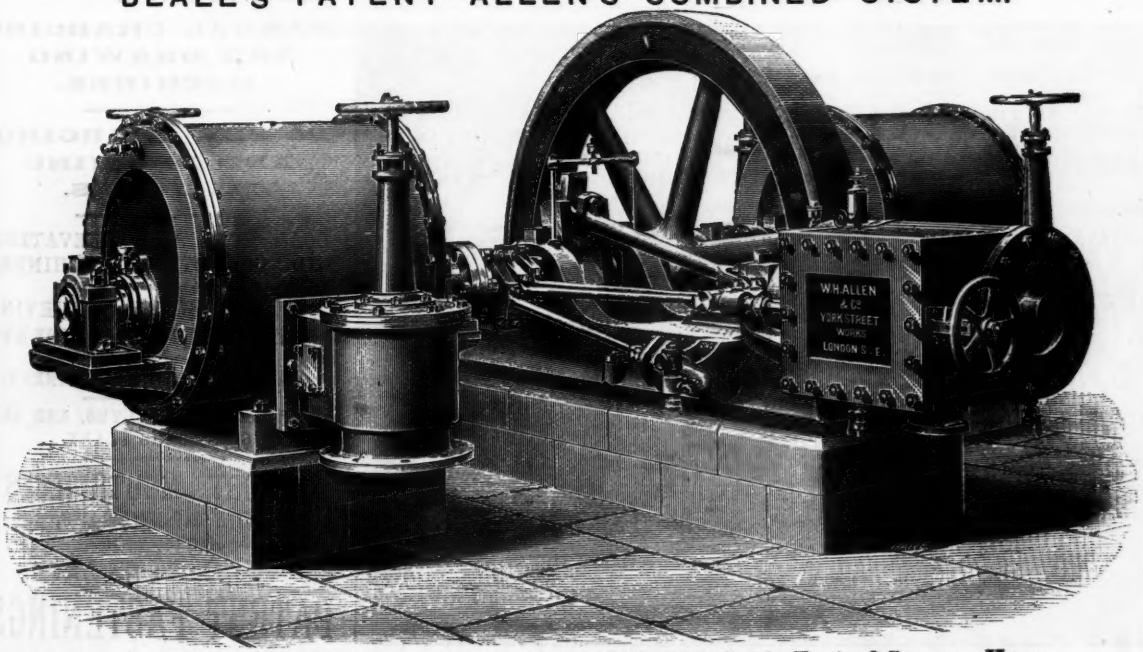

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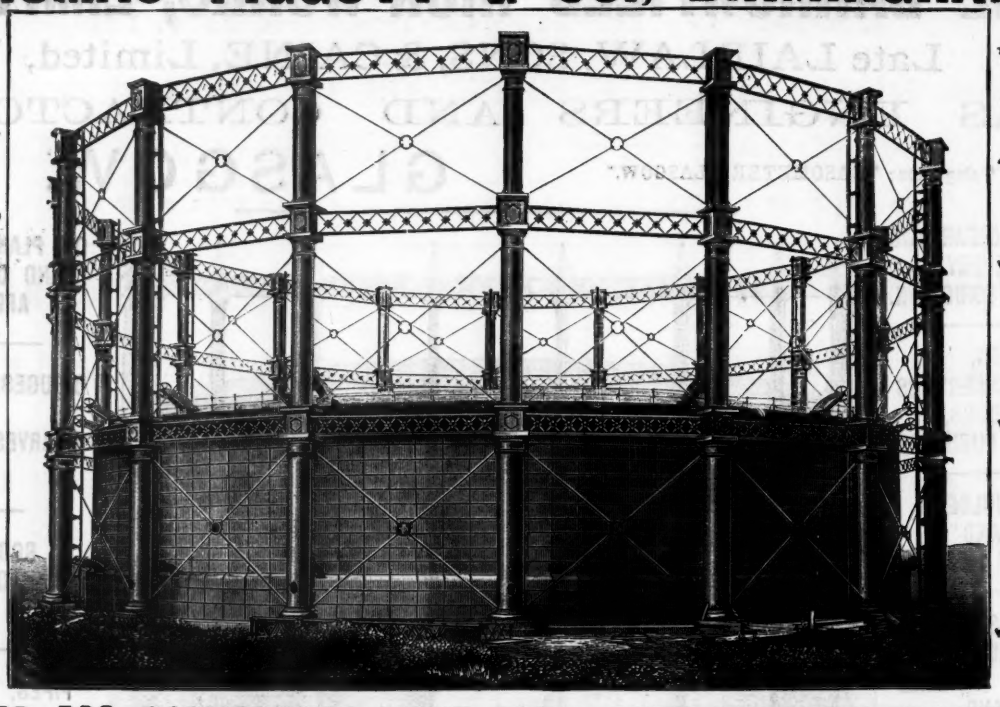

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OVER 500 GASHOLDERS HAVE BEEN SUPPLIED AND ERECTED,

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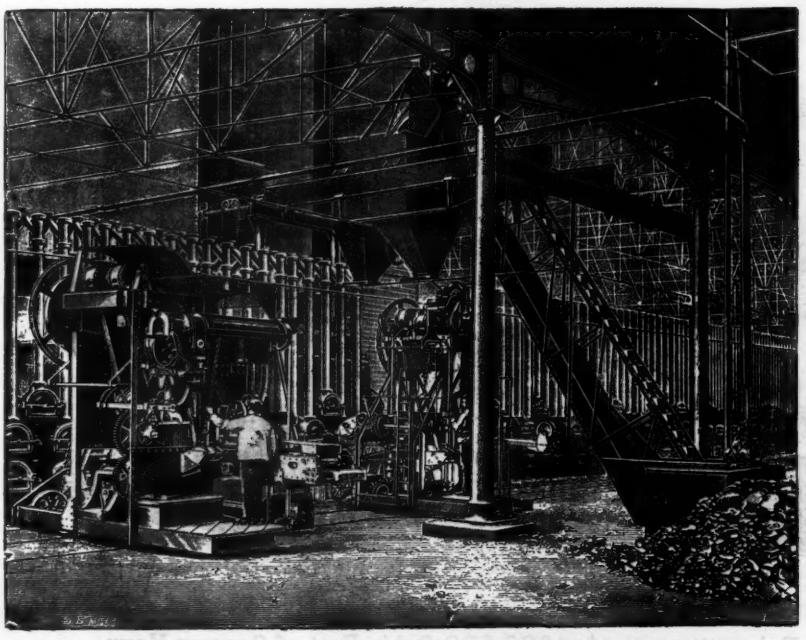
Engineers, Ironfounders, and Contractors,

ALBION IRON-WORKS, MILES PLATTING, MANCHESTER,

Manufacturers of

WEST'S PATENTED MACHINERY FOR CHARGING AND DRAWING GAS-RETORTS.

OVER **180** MACHINES AT WORK AND IN COURSE OF CONSTRUCTION.



INTERIOR OF RETORT-HOUSE, SHOWING WEST'S PATENTED POWER CHARGING AND DRAWING MACHINERY.

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POWER CHARGING AND DRAWING MACHINES.

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COKE BARROWS, VALVES, AND ALL GAS-WORKS PLANT.

RETORT MOUTHPIECES

WITH SELF-SEALING LIDS,

FITTED WITH

KING'S PATENT FASTENINGS.

N.B.—The whole of these Fittings are made of Wrought Iron.

SPENT LIMES NO LONGER WASTE PRODUCTS.

Under G. R. HISLOP'S PATENTS

All Spent Limes are most effectually, economically, and continuously recovered, and at from one-third to one-half the cost of New Lime. The results are a surprise to all who have inspected the process, and are entirely satisfactory to all now using it. Descriptive Pamphlet and Terms from Agents as under.

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A NEW CARBURETTOR FOR ENRICHING GAS IN BULK.

Used by the largest Gas Companies in London, and entirely superseding the use of Cannel Coal.

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48, SUFFOLK HOUSE, LAURENCE POUNTNEY HILL, E.C.

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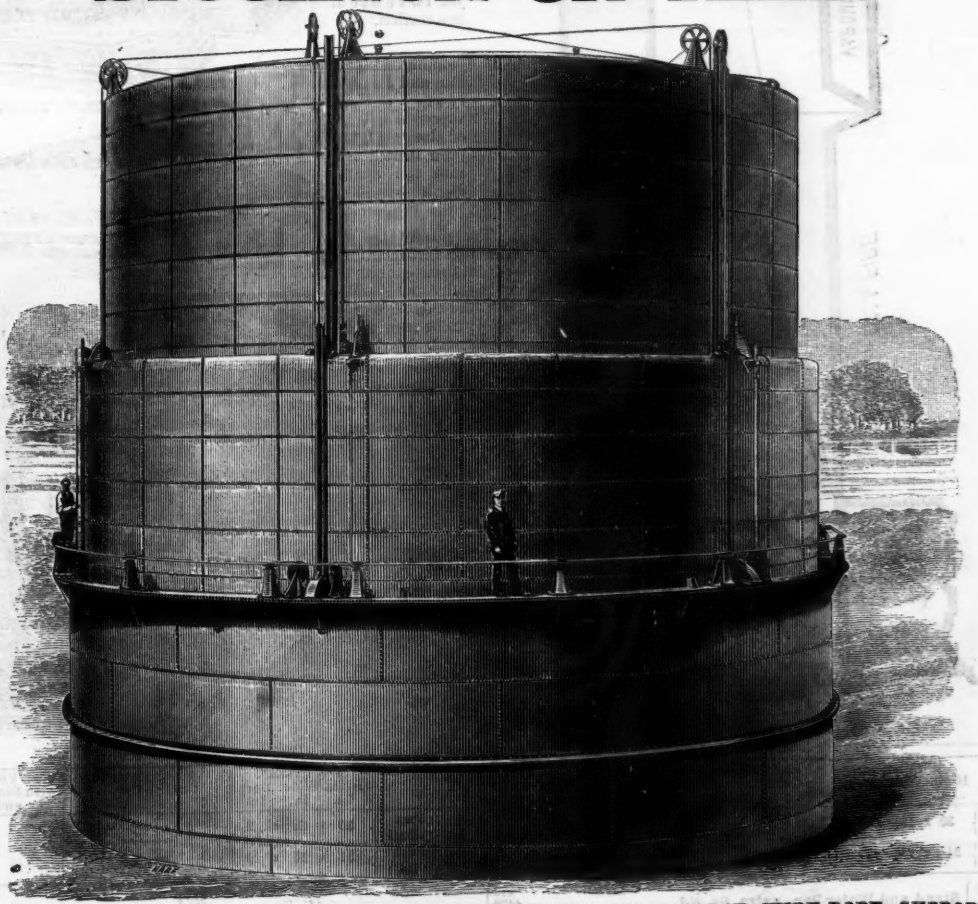
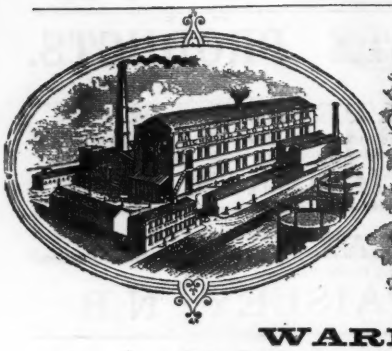


TWO-LIFT GASHOLDER, WITH TANK, WORKING WITH PEASE'S PATENT WIRE-ROPE SUPPORTS.

(From Photograph.)



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GAS FIRES
Heating Stoves
WATER HEATERS
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GAS ENGINEERS

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Sole Agents for Webb's Lamps.

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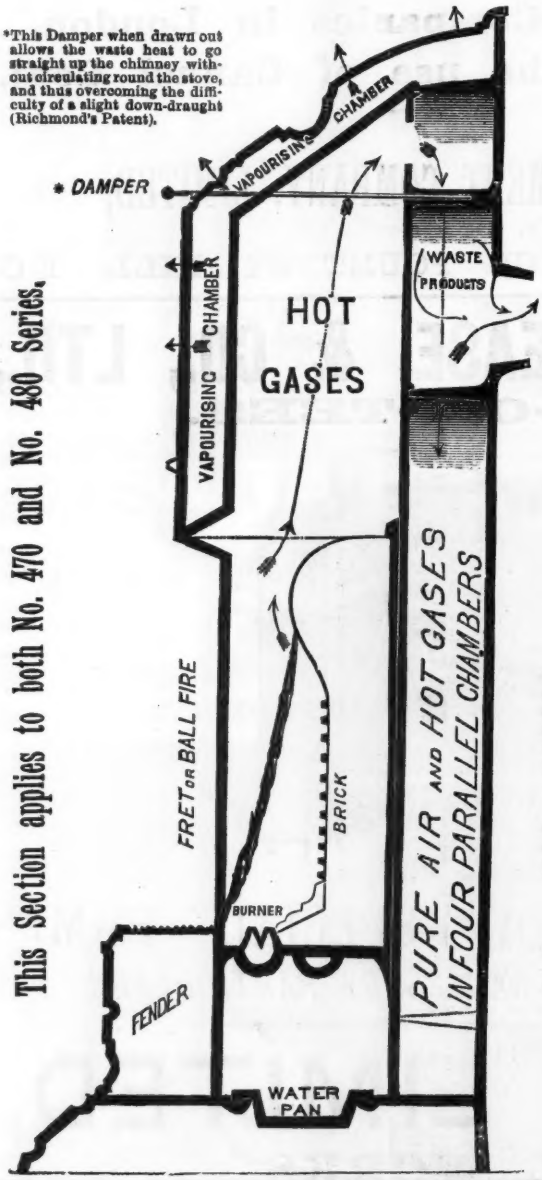
*This Damper when drawn out allows the waste heat to go straight up the chimney without circulating round the stove, and thus overcoming the difficulty of a slight down-draught (Richmond's Patent).



This Section applies to both No. 470 and No. 480 Series.

In these Stoves we have combined—

1. Chaste and Elegant design. The Ornaments are relieved artistically with Gold, and Figures Bronzed.
2. Most Perfect Patent Waste-Heat Arrangement yet invented. See section.
3. A combined Water Pan and Fender, from which vapour is delivered along with the pure heated Air into the apartment.

The advantages of the two last-mentioned features cannot be over-estimated. We are sure this Fire only needs to be seen to be purchased.

Filled with Double Corrugated Iron Fret or Ball Fuel at same price.

WE CAN NOW DELIVER ON RECEIPT OF ORDER.

The "VICTOR." No. 480 Series.

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	With Stand. High. In.	Wide. In.	Deep. In.	Stove Enamel Gold Relieved. Figures Bronzed.	Best Victoria Bronze, with Stand, Water-Pan, and Damper.
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472 Fret 1472 Ball	31½	21½	9	£2 15s.	£6 13s.

	With Stand. High. In.	Wide. In.	Deep. In.	Stove Enamel Gold Relieved. Figures Bronzed.	Best Victoria Bronze, with Stand, Water-Pan, and Damper.
480 Fret 1480 Ball	30	22	9	£2 15s.	£6 3s.
482 Fret 1482 Ball	31	24	10	£3 5s.	£7 3s.

Make Stove very complete. Stand and Water-Pan, extra 8s. 6d. Richmond's Patent Damper, extra 4s. 6d. Sizes, 470, 1470, 480, 1480: 22 in. × 12 in. × 2 in. high. 472, 1472, 482, 1482: 24 in. × 13 in. × 2 in. high.

* Temporary London Offices and Show-Rooms, 63 & 65, Basinghall St., E.C. Mr. J. F. Simmance (for 17 years with W. Sugg & Co., Ltd.), Branch Manager.

TANGYES'
"SPECIAL" STEAM-PUMP

(TANGYES' & FLOYD'S PATENTS),

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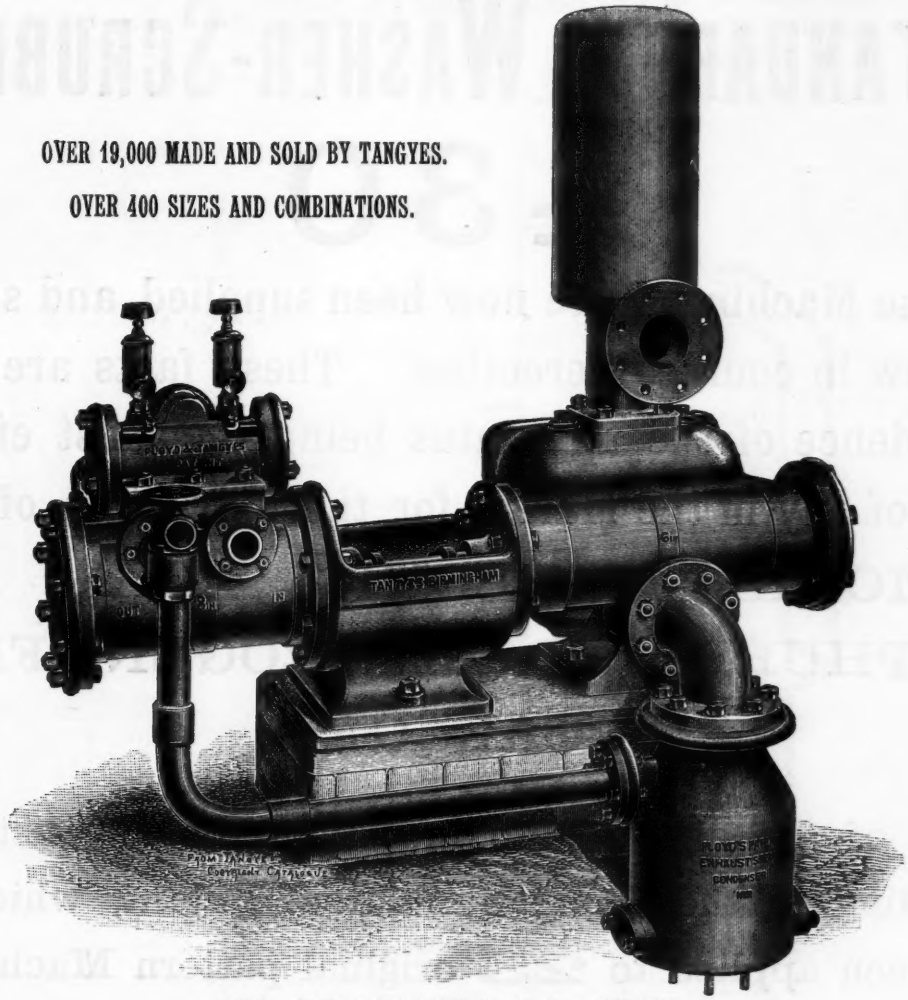
This Condenser is a useful adjunct to the "Special" Steam-Pump when used in mine workings or other confined positions where it is difficult to convey away the exhaust steam. The latter is carried into the condenser, and there condensed by the water which is being drawn into the pump.

OVER 19,000 MADE AND SOLD BY TANGYES.

OVER 400 SIZES AND COMBINATIONS.



FROM A PHOTOGRAPH OF THE 8in. by 6in. by 12in. SIZE.

APPLY FOR SYNOPSIS OF "SPECIAL" PUMPS.

QUOTATIONS ON RECEIPT OF NECESSARY PARTICULARS.

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PATENT "STANDARD" WASHER-SCRUBBER.

430

of these Machines have now been supplied, and several are now in course of erection. These facts are given as evidence of the apparatus being the most efficient of any in the Market for the extraction of

AMMONIA, CARBONIC ACID, AND SULPHURETTED HYDROGEN FROM COAL GAS.

50 of the above Machines have been constructed according to the Company's latest Patent, which has also been applied to **25** original pattern Machines.

Estimates furnished for Cost of altering original pattern Patent "STANDARD" WASHER-SCRUBBERS, or for the supply of New Machines, on application at the Company's Offices,

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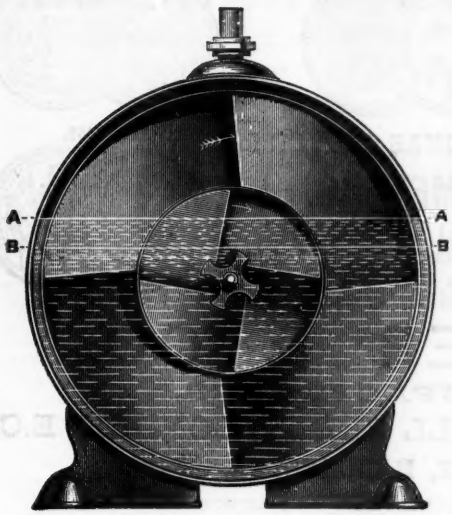
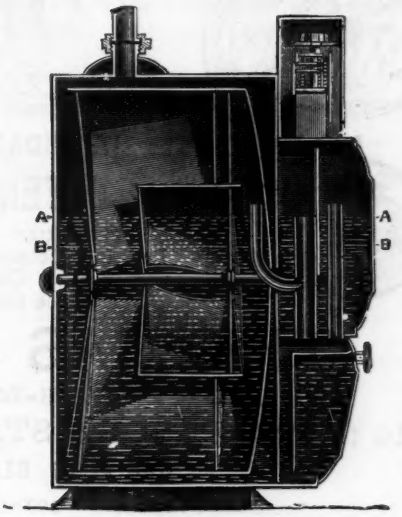
WESTMINSTER, S.W.

THE WARNER AND COWAN METER.



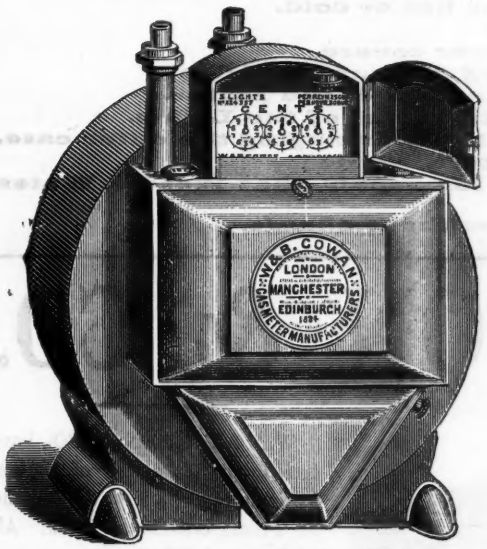
A A, High-Water Line.

B B, Low-Water Line.



Drum in Case. Hollow Cover removed.

Sectional Side View of Meter.



Elevation showing Tin Case Meter.

Elevation showing Cast-Iron Case Meter.

In its completeness as a measure, the WARNER AND COWAN drum differs from every other. Of definite capacity, irrespective of the water-line, it can neither be over nor under filled, but discharges at each revolution the same volume of gas.

It is to this also that its secondary, though important, advantage is due—viz., the long float-range which this drum permits.

The illustrations show front and side views of the drum, and also views of the complete meter—both in tin and cast-iron case.

The drum being of fixed capacity within itself, the extraneous mechanism and arrangements are of the most simple character. These include all that is necessary, but exclude all that would be superfluous.

W. & B. COWAN,

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"DISC LONDON."

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London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865. Paris, 1867.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.
Since then we have not Exhibited for Prizes.

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1st—Are a remedy for all the defects of Wet Meters.
2nd—Are suitable for all climates, whether hot or cold.
3rd—Incur no loss of Gas by Evaporation.
4th—Cannot become fixed by Frost, however severe.
5th—Are the most accurate and unvarying measurers of Gas.
6th—Prevent jumping or unexpected extinction of the Lights.
7th—May be fixed either above or below the level of the Lights.
8th—Cannot be tampered with without visibly damaging the outer case.
9th—Will last much longer than Wet Meters.
10th—Will not cost more than one-half for repair that Wet or Water Meters do.

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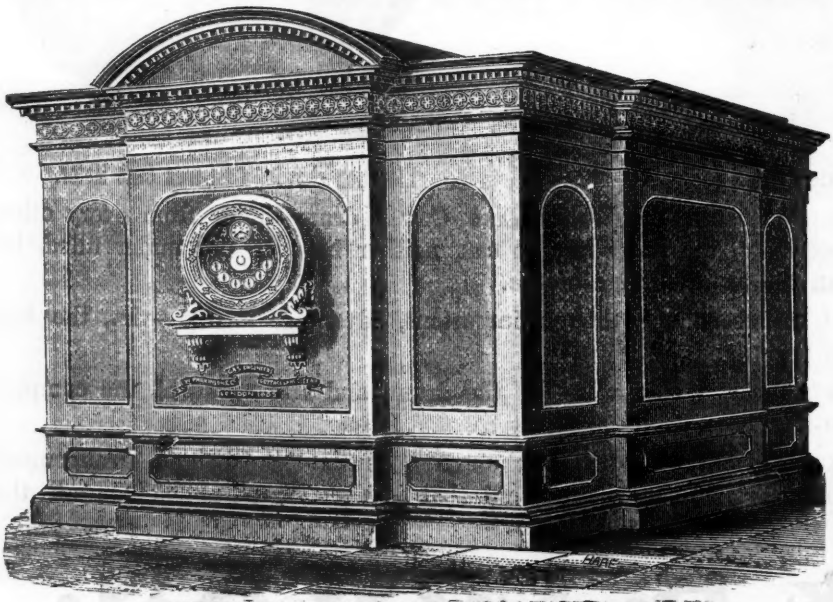

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TO CORRESPONDENTS.

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TO ADVERTISERS.

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, DECEMBER 15, 1891.

The New Standard of Light Committee.

ADDITIONAL intelligence has transpired during the past week with regard to the unexpected revival of the Board of Trade project for further inquiry into the question of a new photometrical standard, to which we were only able to refer in the last issue of the JOURNAL as a matter that had occupied the attention of the Common Council of the City of London at their meeting on the previous Thursday. When the London County Council assembled on the following Tuesday, the subject came before this body practically in the same way that it had come before the City authorities—in the form of a request by the Board of Trade for the nomination of representatives to constitute part of the contemplated Committee. It further appeared that we were in error in supposing that the expenses of the Committee are to be divided between the interests represented by it. The South Metropolitan Gas Company have offered to bear the whole of the cost; and this offer has been accepted by the Board of Trade. It may therefore be concluded that, whatever the other London Gas Companies may think about the matter, the inquiry will go on; and it is equally reasonable to suppose that the finding of the Committee will form the basis of the parliamentary action to be taken in due time by the London County Council. It would have been a little too ridiculous if the Council had persisted in their original intention, and had proceeded to disestablish the standard sperm candle while the Board of Trade confessed an inability to recommend a suitable substitute for the sanction of Parliament. Some surprise may be felt in certain quarters at the action of the South Metropolitan Directors in volunteering to pay the bill for the new investigation, after the other London Gas Companies had declined to bear any share of such outlay. But here again it is the unexpected which has happened. It should be remembered that Mr. George Livesey has always taken great and particular interest in the subject of gas testing. He was a member of the last Board of Trade Committee which dealt with the condition of the question of the standard ten years ago; he would have agreed at any time to the settlement of the matter by the Board of Trade upon the generally-admitted data; and he put himself into communication with the London County Council with regard to this very subject by the letter which may be said to have re-awakened the desire to deal with the anomalies of gas testing as applied under the direction of the Gas Referees. Consequently, when the movement for effecting a much-needed reform was blocked for want of funds to carry it on, Mr. Livesey was of all others the London Gas Director who would be readiest to remove the obstacle. He knows most about it, and has the liveliest sense of the loss which must go on in every gas-works in London while the responsible manager has to allow his output at least an extra candle of illuminating power, to compensate for the possible irregularities of the standard wherewith the duly-appointed officer tests it. All the same, we do not suppose for a moment that Mr. Livesey's interference in this affair will be favourably regarded by all parties who are naturally most deeply interested in procuring a settlement of the long-standing difficulty. It is quite likely that some opposition will be raised to the work of a Technical Committee which he is known to favour, if he has no more to do with it than recommending his Board to pay that Committee's charges. But Parliament will know best how to deal with opposition of this character. We still think that it would have been more dignified, and in every way preferable, if the Board of Trade, who appoint the Committee, could have paid for it; and we should like to know the reason a grant for this purpose could not be included in next year's estimates of the Department. It may be asked why, after all the investigation that has been devoted to this subject, a fresh Committee is deemed necessary. In answer to this inquiry, it could be said that some years have elapsed since the last authoritative report upon the matter appeared; and it is therefore desirable that the published data favouring a reform should be supplemented by information duly corrected to date. Parliament will thus escape the reproach of legislating upon stale evidence. We trust that this time the business will be duly carried to a satisfactory conclusion; and that the wasteful and ridiculous practice of testing the illuminating power of gas by a shifting standard will soon become obsolete.

The Consequences of the Blackburn Explosion.

THE legal proceedings following the Blackburn explosion illustrate one of the peculiarities of the English Constitution, inasmuch as there has been disagreement between the two Courts of concurrent jurisdiction which have cognizance of such matters—the Coroner and his jury, and the local Magistrates. The former are the more venerable authority; and the result of their inquiry calls for our first consideration, especially as the evidence upon

which it was based gives a version of the facts of the occurrence differing in some important respects from the information upon which our last week's commentary was based. We are particularly anxious to avoid making any statements here that might be construed into a prejudgment of the rights and wrongs in this matter, because there will be work for more than one kind of Court before the record of the consequences of this deplorable catastrophe is completed. The Coroner's jury, after hearing the accounts of different witnesses respecting the manner in which the five victims of the explosion came by their death, concluded that the affair was "accidental." Upon the same evidence, the Magistrates committed for trial the two men who confessed to having attempted to disconnect the gas-meter in the basement of the wrecked hotel. Both authorities had before them not merely the same evidence of fact, but also the same statement of the law applying to the removal of gas-meters from consumers' premises wherein they had been connected up for the measurement of the gas supplied. The men Robinson have told how they unscrewed the meter unions, and contemplated removing the meter without notifying the Corporation Gas Department of the fact, as by law is required of anybody and everybody desirous of performing such an act. The Blackburn Coroner very properly told his jury that it is an illegal act to remove a meter without giving notice; and as to the two men who, in the case in point, had engaged in this very thing, he declared his opinion "that a person who caused death by doing a lawful act in "an improper manner was guilty of manslaughter equally "with a person who did an unlawful act in an improper "manner." Notwithstanding this clear statement of the law, the Coroner's jury declined to hold the implicated persons liable for the consequences of their error. It is probably safe to assume that pity for the unhappy men was largely instrumental in evoking this merciful verdict. There was no suggestion whatever that the result of what was done to the meter, whether legally or illegally, was anything but unintentional on the part of the Robinsons; and it is very like a jury to pay considerably more heed to motive than to strict law, when it is a question of assigning blame for causing a casualty. Circumstances count for everything in such cases as this. Moreover, there seems to have been some doubt respecting what had previously been done to the meter by the servants of the Corporation Gas Department. Gas ceased to be supplied through the meter on the 30th of September, the end of the quarter; and, with due promptitude, the meter inspector received his instructions to take the register of the index, and to have the meter plugged. Evidence was given to the effect that this was properly done. Two labourers in the employ of the Gas Department testified to the plugging; and the inspector swore to having examined the meter twice afterwards, to having ascertained that the pipe could not pass gas into it, and to having written the word "caulked" on the case. It appears, however, that the meter was not left by the Corporation men so disconnected that it could be moved; neither was the service-pipe cut off outside the premises. Without offering any comment upon these circumstances, it is obvious that they may have weighed with the jury. The fact remains, however, that nobody had a legal right to touch the meter but the proper officials of the Gas Department; and if they had been called in, there would have been no question as to whether the meter was or was not properly treated on the previous occasion. The two unskilled men meddled with the meter connections upon their own responsibility, and disconnected something—what it was may never be proved—with the results upon record. For this deed the Magistrates, with more regard for the law than the Coroner's jury (but not more than the Coroner himself), have sent the men for trial. We fail to see how they could have taken any other course. It is for the protection of the public that unauthorized persons are forbidden by statute from tampering with meter connections; and the gravity of the results of a disregard of this prohibition constitutes the strongest reason for enforcing the law at all costs, and irrespective of sentimental considerations.

The Board of Trade Returns relating to Authorized Gas Undertakings.

THE parliamentary returns relating to the authorized gas undertakings of the United Kingdom have been issued, and the salient figures of these now indispensable papers will be found in another column. The returns relate to 416 Gas Companies and 178 Local Authorities owning gas undertakings. It appears from the grand summary with which both the returns conclude, that the 594 statutory gas undertakings comprised in these tables represent authorized capital to the amount of £77,519,068, of which, up to the periods covered by the returns, £65,344,317 had been paid up and borrowed. By the employment of this capital, £17,300,128 was earned during the year, at an expenditure of £13,149,086; thus showing a gross profit on the trade of supplying the principal towns in Great Britain with gas, of £4,151,042, or less than 6½ per cent. all round. To make the gas required by these towns, 10,242,427 tons of coal and cannel were carbonized, yielding 103,011,038,000 feet of gas, of which 94,546,613,000 cubic feet were sold. The mains through which this great bulk of gas was distributed extended to a length of 21,969½ miles, and served 2,297,278 consumers and 460,384 street lamps. These figures exhibit a progressive rate of increase under all heads; thus illustrating the growth of the demands of the people for gas for every purpose. It is easy for empty-headed persons to talk glibly about the "monopoly" of gas supply in this country, and, as appears from another paragraph, to demand "the regulation of the "quality and price of gas on a basis more efficient than "the present system." We should like to be informed as to the nature of this improved means of regulating the gas industry. If one is permitted to judge of methods by results, what are we to say of the system that has produced the figures embraced in these striking returns? Where else is gas so largely employed; and where is it so cheap, and, on the whole, so good? The plain, unadorned data relating to the British statutory industry of gas supply contained in these annual returns are a most eloquent demonstration of the important status which this industry has attained under its actual method of regulation, and a most weighty argument against rash interference with the conditions that have produced such large results.

The Progressives of the County Council and their Programme.

THE precious production of the busybodies who call themselves the "Progressive Party," in what is politely termed London municipal politics, which has already been discussed in the JOURNAL under its ambitious title of "The London Program," has been to the fore again during the past week. The name of Progress is doubtless one to conjure with, especially before audiences who do not stop to consider whether progression may not be as easily made in a wrong direction as in a right one. There are many marks of a Progressive policy, as there are of a Progressist politician and a Progressist "organ;" but the puzzling thing is that these signs cannot be safely used as the bases of generalizations. The mark of Progress in respect of one cause, or even at one period, is by no means to be relied upon as the sign of the same political party in other circumstances and at another period. It is necessary to correct one's ideas respecting the classification of principles, or ideas, or measures as being either "Progressive" or "Reactionary," by referring to the persons and the party with whom they are identified, or by which they are adopted. Thus it might be considered that direct taxation, as opposed to indirect methods of raising revenue for the public service, is as sound a "plank" as could be found in the Progressist platform. It is so, however, only to a certain extent. Your true *fin de siècle* Progressist objects strenuously to the indirect taxation of the people—when it is to the advantage of any governing body with which he is not connected. Thus in London, for example, the old Metropolitan Board of Works and the Corporation of the City rejoiced in the revenue obtained from the extinct coal dues, which the latter authority unaffectedly regret. The new Progressist party, however, whose "cue" it is to abuse the Metropolitan Board and disparage the City, will have nothing to do with coal dues—partly, no doubt, because this is a case of "sour grapes," and also because the benefit of any such source of revenue, if it were revived, would have to be divided between the County Council and the City Corporation. The objection on the part of the Progressists of the County Council to indirect taxation does not extend to gas. The City Corporation never had the advantage of a tax upon gas, and therefore it seems to be thought that if the County Council could only contrive to get control of the gas supply, they

might do whatever they pleased with all the money they could wring out of the consumers by way of "profits." It is consequently not surprising that the acquisition of the gas supply of London appears as a prominent item in the authorized programme of the Progressist party in the County Council. Fortunately or unfortunately, as opinion may run, the London County Council, although endowed with powers peculiar to itself among the bodies of contemporary origin and belonging to the same class, cannot do everything. Parliament, in its wisdom, thought that the first administrative body for all London would have enough to do in picking up the threads of business dropped by the Metropolitan Board, and in organizing the more extended work confided to it by its organic statute. Indeed, until the new body had got into something like working order, it was next to impossible to say offhand what it could or could not do. In order that the first Council should be an executive body, rather than a discussion forum, the Act of Parliament which formed its constitution did not overload it with debateable responsibilities; but this consideration has since been derided as an indication of "Governmental distrust" of the new Metropolitan Authority. Among the other matters which the London County Council are constitutionally precluded from interfering with, is the gas supply. To the Progressist party in the Council, who have provided themselves with as many parliamentary appanages as possible, and confess to a hankering after full parliamentary powers, this limitation appears like an outrage and an insult. "Do their own business," indeed! "confine "themselves to the work entrusted to them by Par- "liament." Certainly not; "they have souls above "that sort of thing." Such, in brief, is the Progressist attitude. They desire to do all sorts of things which Parliament has not permitted them to touch; and, in order to help pay their expenses, they want the revenues of the Gas Companies. This is how the matter stands in the revised programme. (If the JOURNAL were a truly Progressist publication, it would be badly printed, on inferior paper, and would spell the word in question "program," as written in the American language preferred to English by all "advanced" newspaper scribes. These are infallible proofs of a "Progressist" organ!) The programme, as adopted by the Council of the London Liberal and Radical Union, contains this article: "The control of the gas "supply to be obtained by the regulation of the quality "and price of gas on a basis more efficient than the present "system, and by the creation of a Statutory Committee "with power either to provide a municipal supply or to take "over the Companies on terms fair to the ratepayers." Observe, the terms need not be fair either to the present owners of the property or to the present and prospective consumers of gas. But this is your Progressist all over. Blissfully unconscious of the "many-sidedness of things," he wishes to liberate the machine of local self-government from all control beyond the snap vote; and, putting blinkers on the drivers and pilots, so that they shall only see what lies directly before their noses, he would urge it on at the highest possible speed, totally regardless of the consequences of his action. Progress is always progress, of course, even when it is along a No Thoroughfare planned by Faddists.

Mr. John Holliday, chief assistant to Mr. Hepworth at the Carlisle Gas-Works, has been elected a Fellow of the Chemical Society.

Death of M. Alphand.—The recent death is announced of M. Alphand, the well-known Director of Works in Paris. According to the Paris correspondent of *The Times*, M. Alphand was born at Grenoble in 1817, and was appointed in 1839 Surveyor of Roads and Bridges at Bordeaux. M. Haussmann, who was then Prefect of the Gironde, appreciated the ability and activity shown by him in embanking that river; and when he was himself summoned to Paris, he took Alphand with him. Haussmann, as everybody knows, did much to clear away slums and open new boulevards; and Alphand was his indispensable auxiliary. The latter had an especial gift for designing public gardens and promenades. He had an active share in the Exhibition of 1878, and took the leading part in that of 1889. In acknowledgment of the unprecedented success of the latter, he was made a Grand Cross of the Legion of Honour—a rank not previously reached by a civil engineer. He also succeeded Haussmann last year in the Academy of Fine Arts. Though he had had two paralytic attacks, he retained his post till the last; and till within a fortnight of his death, he discharged the duties devolving upon him.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1093.)

THE course of business in the Stock Markets during the past week has been much of the same nature as that which characterized the preceding week—that is to say, business of the speculative description is narrowed down to very small proportions, and more attention is being given to high-class securities for investment purposes. The week has been free from agitation; and no alarmist rumours have been flying about to create distrust. But the disposition to be cautious still prevails; and there will be no renewal of activity at this time of the year. The Bank rate was reduced on Thursday to 3½ per cent.; having stood at 4 per cent. since Oct. 29. It was generally expected, and had no effect in the markets beyond confirming the inquiry for investment stocks. The Gas Market has been only moderately active; but the tendency to firm prices generally has been well maintained. Business has been mostly in the stocks of the Metropolitan Companies. Gaslight "A" has been steadily done throughout the week at an advance of 1 upon the previous quotation; touching 230 on Tuesday. It will be remembered that, a couple of months ago, it was marked one day at 206. The debenture and preference issues have been brisk, and changed hands at very good figures. On *ex div.* adjustment, the former stock works out fractionally higher; but the "H" 7 per cent. limited was disposed to be easier. South Metropolitans have been more active, and are very firm; top prices for both the "B" and "C" classes being realized more than once. Commercials are quiet and unchanged; the very few transactions recorded showing only moderate values. Suburbans and Provincials have scarcely attracted any business; and the only feature among them is a drop of 1½ in Bristol. Continentals are firm, though there was not very much doing in them. Imperial Continental improved 2; and buyers of Continental Union made a 5 per cent. better price. The Indian section were a good deal dealt in, especially Bombay, which fell away; the £4 paid shares receding ¼. But Oriental was firm. South Americans made no sign. Among the rest, Chicago bonds of both issues were conspicuous with a material advance in price. The Water Companies show continued weakness; and quotations are further reduced, especially Southwark and Vauxhall, the "D" shares of which have fallen 10. The debenture stocks, however, have a tendency to rise in value.

The daily operations were: On Monday, Gas was active and firm. Gaslight issues of all sorts were much dealt in; and the "A" rose 1. Water was quiet and unchanged. The Gas Market was not quite so active on Tuesday; but the tendency on the whole was very favourable. Gaslight "A" was done at top price, and other issues were firm; but Bombay new fell ¼. No business was marked in Water; but Grand Junction was put 3 lower. Gas was very quiet on Wednesday; but there was no falling off in firmness, especially in South Metropolitans and Imperial Continental. Chicago bonds rose 4 and 5 respectively. East London Water fell 2½. Thursday was a rather more active day for Gas, with a favourable tendency. Imperial Continental rose 2. Friday presented no special feature; and the only move was a fall of 1½ in Bristol. In Water, New River debenture rose 1½; but Southwark "D" fell 10. Business on Saturday was about as usual; and quotations closed without further change.

ELECTRIC LIGHTING MEMORANDA.

Professor Crookes on Electricity and Science—Professor Crookes's Electric Lighting Venture—The Condition of the Ferranti System.

AT the recent annual dinner of the Institution of Electrical Engineers, the President (Professor William Crookes, F.R.S.), in proposing the toast of the evening, "Electricity in Relation to Science," took the opportunity for delivering a neat little oration more or less bearing upon his subject. The idea of proposing such a toast is a reminder of the old-fashioned usage of drinking to "sentiments," which has persisted across the Atlantic, although it has long been discontinued in England. Professor Crookes took good care that his observations should be properly reported, which was highly necessary to prevent his somewhat transcendental imaginings from being made nonsense of by well-meaning but unscientific printers. He referred sympathetically to the experiments of Professor Nikola Tesla for producing light by novel manipulations of electrical currents; and he hinted at the possibility of discontinuous phosphorescent light emitted from certain of the rare earths, when excited by a high-tension current in a high vacuum, being really an artificial production of electrical rays sufficiently short to affect the organs of sight. He stated that "if such a light could be produced more easily and more regularly, it would be far more economical than light from a flame or from the arc." It is to be taken, we suppose, as of a piece with the "contrariness of things in general" that this interesting phenomenon is only producible with certain earths of such rarity that very few people besides Professor Crookes have ever seen them. Now, why should this be? Why should Nature confine such striking manifestations of her infinite possibilities to those

materials which mankind calls precious, because they are accessible by him only with great difficulty, and then in insignificant quantities? It is at any rate a striking aspect of this most interesting subject that, while ordinary electric lighting methods are admittedly too dear ever to be truly popular, the only prospect of economical electric light is an attribute of some of the most costly of natural productions. One can understand how Professor Crookes, who is one of the most practical-minded of men of science, must be disappointed at not being able to do with lime and clay what appears possible with yttria, or some other of the strange earths which have only been discovered to exist through his searching investigations.

It is creditable to Professor Crookes's reputation for devotion to pure science, that he should have been able to discourse so brilliantly upon the relations of electricity to science, while he must have been subject to daily reminders, in his capacity of Chairman and professional adviser of the Notting Hill Electric Supply Company, Limited, that the commercial relations of electric lighting ventures are very far from universally satisfactory. Mr. Crookes has done his very best to make this undertaking a success; yet somehow the advent of the expected era of dividends is delayed, and the Company's shares stand at a discount. A curious bit of correspondence relating to the method by which electric light business is done—or rather, to be quite correct, is not done—in this Company's domain has just been published. Last October twelvemonth a resident in the Notting Hill district was canvassed by some electrical engineers represented as being connected with the Company; and in the following December he agreed to have his house fitted for electric lighting, stipulating at the time, with a rare but admirable caution, that he should not be required to pay for the wiring before the current was supplied. The contractors finished their job, but no electricity was forthcoming; and the householder learnt from the Company, only a few days ago, that no connection could be made for the present with the mains for his benefit unless he agreed to subscribe at par for an amount of capital in the Company equal to the estimated cost of the service, which in his case is £350. Very naturally, the gentleman does not think this suggestion "good business;" and so he admits the public into his confidence, in order that other intending customers of central-station lighting companies may take warning from his experience.

By the way, there seems to be something very much amiss with the biggest of all the Metropolitan Electric Lighting Companies—the London Electric Supply Corporation, whose shares (£5 paid) are quoted at little over £1, having dropped steadily during the past few weeks in consequence of unfavourable rumours respecting the condition of the Deptford plant. It has been reported that the Ferranti system of working at 10,000 volts in the trunk mains has broken down; and that the whole scheme of supply will have to be reconsidered, which means the abandonment of much for which the Company have paid away a great deal of their capital. In view of the fact that the Directors of the Company thought fit to dispense with Mr. Ferranti's further services as Chief Engineer as from last August, we are not inclined to join in the hue and cry that has been raised over the alleged failure of the system of electrical distribution for which he is responsible. We think, and have frequently stated as much, that the Deptford plant is a wonderful creation of engineering and electrical skill. Whether it is the best system for supplying electricity to London at a profit, is another matter. The proof of that pudding must lie in the eating, and if it should turn out that the Directors of the Company find the taste of their concoction unpleasant—well, so much the worse for them. It seems only fair, however, that those who are now preparing to condemn Ferranti, on account of the alleged failure of his device for solving a still standing problem should also look round and over the whole field, and ask themselves who else is succeeding, and why? The Deptford scheme was a singularly bold and masterly plan, and in its execution it upset a host of prejudices and accomplished many declared "impossibilities." There is no pleasure to be derived from witnessing the shipwreck of honest enterprise. We rejoiced without reserve over the collapse of the baseless Brush and other speculations of ten years ago; because there was something very like gambling at the bottom of them, and of all the money that went for "concessions" and similar imaginary properties hardly a penny was applied to found real industry or to advance true science. Mr. Ferranti, on the contrary, has "had a good try;" and if he took a wrong course, he is more to be commiserated with than blamed.

The Board of the Croydon Gas Company has been reconstituted for the election of Mr. Hyslop to the position of Chairman, formerly occupied by the late Mr. C. Newton. Mr. Allen J. Lambert has been appointed to succeed Mr. Hyslop as Deputy-Chairman of the Company.

Spontaneous Combustion in Coal Cargoes.—Three prizes of 1000 marks (£50), 2000 marks, and 5000 marks respectively are offered by the Shipping and Forwarding Company of Hamburg, for the three best chemical methods, or mechanical arrangements, for the prevention of spontaneous combustion in coal cargoes. Competitive treatises will be received up to July 1, 1892, from engineers and chemists of any nationality.

THE JURORS' REPORT ON GAS LIGHTING APPARATUS AT THE FRENCH EXHIBITION.

THROUGH the kindness of M. Cornuault, the well-known Engineer and ex-President of the Société Technique du Gaz en France, we have received a copy of his official report upon the exhibits in Class 27 of the Paris Exhibition of 1889, which comprised apparatus and arrangements for lighting (not electrical). This publication, which is issued by authority of the Ministry of Commerce and Industry, forms one of a series of Jury Reports compiled under the direction of M. Picard, Reporter-General for the Exhibition, which constitute a complete record of the exhibits at the last great "Exposition Universelle Internationale," and are consequently valuable books of reference for technicians of all classes. Whatever may be the character of the other reports, which we have not seen, we have no hesitation in stating that M. Cornuault's work is a credit to the author and to French gas engineering science, and accordingly deserves a place in every gas engineer's technical library. It contains a mass of useful information, clearly arranged and intelligently criticized; and many of the author's observations upon gas-burners are of particular value. Without pretending to enable readers of the JOURNAL specially interested in the subject to dispense with the original, we may give a general idea of the nature of this exhaustive report.

The author introduces his subject with the remark that "the lighting industry interests the whole human race;" but he mercifully spares his readers the ancient history of artificial lighting—saying, indeed, that "lighting, properly so called, is one of the special conquests of the nineteenth century." He dates modern progress in the production of artificial light from the invention of the Argand oil-lamp, samples of which, he states, were first shown in public on April 29, 1784, at the Comédie Française. The Argand lamp was improved by Carcel and Gagneau; and in 1836 it became, in the hands of Franchot, the "moderator" lamp, which persists to this day as the best arrangement for burning heavy vegetable oils. True to his nationality, M. Cornuault ascribes the invention of gas lighting to Lebon; but he admits that the early days of this new industry were particularly troublous, and that it was not before 1830 that gas lighting was really established in France, with the result of transforming the conditions of public and private lighting in the country. To the period 1830-40 M. Cornuault assigns another great advance in lighting—the production by de Mielly of the stearine candle, or *bougie*, which gradually displaced the earlier *chandelle*, or torch, of wax for the rich, or of tallow or resin for the poor. It is worthy o-remark that, although the English word "candle" is etymolof gically the same as the French word *chandelle*, it does not mean the same thing when it occurs in technical writings. Popularly, the French speak of *chandelles* just as English people do of candles; but to a French gas engineer the modern mould candle is not a *chandelle*, but a *bougie*. From 1840 to 1860, lighting developed upon the old lines, according to M. Cornuault, without new inventions. This was an age of consolidation of gas companies. From 1860 to 1870 mineral oil-lamps became popular, thanks to the exploitation of the American petroleum fields. In 1878 a great change came over the industry of artificial lighting, through the appearance of the electric arc upon a commercial footing. Thenceforward conditions that actually exist put themselves in evidence; and all kinds of artificial lighting received a great impetus, which is yet far from being exhausted. The importation of petroleum into France has doubled during the last ten years; and the production of gas has also increased by 50 per cent. In gas lighting the salient feature of this decennial period is the appearance of the recuperative gas-lamp, due to the genius of Frederick Siemens, the principle of which has been largely adopted, especially in England. M. Cornuault concludes his introductory remarks with the following eloquent passage: "The rapid review thus given suffices to show the path traversed during the century. The need for light grows unceasingly; there will never be enough sources of light to satisfy the increasing requirements of modern civilization. The field to be exploited is boundless; the progress of electric lighting during the last period (of ten years) has intensified the general demand, and developed, to the advantage of all, the lighting effect due to other sources of illumination."

After this, M. Cornuault divides his task into three parts, devoted respectively to lighting by vegetable oils, by mineral oils, and by gas. With the first two sections of the report we are not much concerned. The employment of vegetable oils for lighting purposes diminishes yearly; the moderator lamp being reserved as a luxury for the rich, and no attempt being made to improve it in any other than the artistic sense. It is recorded that, whereas in 1855—that is to say, before the appearance of mineral oil and the popularization of gas—the consumption of colza oil in Paris was after the rate of 5·870 kilos. per head of the population, in 1889 it had sunk to 2·580 kilos. Moreover, the acreage of France devoted to the cultivation of oil-bearing plants is fast diminishing; and we may be sure that this falling off in the consumption of colza would be still more apparent but for its continued use for lighting railway carriages. With regard to the consumption of petroleum in

France, which in 1889 attained to 184,101,000 kilos., M. Cornuault remarks that it has never halted in its development after the rate of 11 to 12 per cent. per annum, from the year of its first introduction, which is a rate of growth greatly exceeding that of gas, at least in recent years. The reason for this is stated to lie in the fact that the distribution of petroleum is on different lines from that of gas. Unlike gas, petroleum is as available for lighting the most isolated house as the town mansion. It therefore goes everywhere; while hardly one-third of the population of France lives within reach of gas. It is observed that this growing popularity of mineral oil in France is in despite of the discouragement of heavy import duties and *octroi*, which amount together, in the case of Paris, to a charge of 0·416 fr. per litre. In the country, where the commodity is less taxed, it commonly sells at from 40c. to 50c. per litre, which is double the usual price in Belgium.

M. Cornuault gives many interesting particulars concerning the designs and performances of different kinds of mineral-oil lamps. Speaking of the Hinks Duplex lamps, which are by him qualified as the first order of mineral-oil lamp *de luxe*, it is recorded that photometrical tests made at the Gas Pavilion of the exhibition, under the direction of M. Sainte-Claire Déville, gave for a continuous six hours' trial a mean hourly consumption for a lamp of this kind of 78 grammes of oil, for a mean illuminating power of 2·14 carcels. The mean consumption of oil per carcel-hour was, therefore, 36·4 grammes. These lamp tests were all made for the same period of six hours; the lamps being weighed and the light measured every hour. In the case of the Duplex lamp, the illuminating power increases (say) from 2·10 carcels when first lit, to 2·50 carcels at the end of the third hour, after which it rapidly falls to 1·62 carcels. Before quitting the subject of lamps, M. Cornuault notices those of the "Lucigen" type, of which he highly approves for certain purposes, and he further remarks upon the great and increasing popularity of oil cooking-stoves.

When he comes to the subject of the gas industry in France, M. Cornuault, as may be supposed, fairly overflows with statistical data; for a French engineer is nothing if not a statistician and a mathematician. The report shows that, in the ten years 1878-88, the gas consumption of France increased by 62 per cent., while that of Paris in particular increased by 42 per cent.; the growth of population for the same period being only 18 per cent. Although this means that the consumption of gas in Paris per head of the population had attained to 110 cubic metres in 1888, M. Cornualt admits that this figure is far inferior to that applying to the consumption of gas in London, which he takes at 150 cubic metres per head; the total consumption in the British capital being in excess of that of the whole of France. There is thus plenty of scope for the French gas industry, not merely with reference to what may be calculated to represent the point of saturation of the community for artificial light, but also with respect to the English standard of gas popularization. It is to be feared, however, that the higher cost of gas in France, as compared with English rates, will somewhat hinder the development of the French gas industry.

Proceeding to the consideration of the gas-burners shown in the Exhibition of 1889, the reporter points out that the previous Exhibition of 1878 had only contained one example of a high-power burner—this being a Sugg's triple-ring Argand. All the other gas-burners were of small power. In 1889 four classes of new gas-lamps had to be formed—comprising, respectively, high-power lamps open to the air, recuperative lamps, incandescent lamps, and lamps for carburetted gas. This simple enumeration of lamp classes demonstrates how much activity has marked this particular branch of the gas industry during the past ten or twelve years. Discussing the high-power gas-lamps open to the air, M. Cornuault declares that none has proved so successful as the Paris Gas Company's model known by the awkward title of the "Fourth of September lamp"—from the name of the street wherein these lamps were first shown in rivalry with Jablochkoff electric candles. It is necessary to remark that this is an example of the force of the adage which accuses every crow of thinking her own young the whitest, because, as a matter of fact, the lamps in question are never seen out of France, and are rare outside Paris.

M. Cornuault has, of course, a good deal to say about the *rationale* and performance of recuperative lamps, the first idea of which he traces to a Frenchman—Chaussenot—who is reputed to have introduced the double-chimney Argand for the purpose of supplying the flame with hot air, at some vague period referred to as "more than half a century ago." This is loose language for a severely scientific report. If Chaussenot did make the first double-chimney Argand, why are not as full and precise particulars of its production given as in regard to the appearance of the original Argand oil-lamps? Although M. Cornuault insists upon the validity of Chaussenot's claim to fame, we are not at all disposed to grant it to him until better evidence in point is supplied. M. Cornuault admits, however, that Frederick Siemens made the first recuperative gas-lamp; and, while conceding the excellence of the performance of these arrangements with lateral chimneys, he remarks that the recuperative principle did not become truly popular out of Germany until the original design of Siemens had been turned upside down, so as to produce a shadowless light. The report states that, after this signal change, the recuperative gas-lamp was improved by many skilful hands, without modification of the principle. The leading varieties are then explained.

After this comes the most original part of the report, consisting of a critical examination of the method of determining the mean spherical illuminating power of recuperative gas-burners, which was practised in the laboratory of the Gas Pavilion of the Exhibition by M. Sainte-Claire Déville, assisted by MM. Salanson and Brisac. The point developed by this criticism is explained as follows: "Luminous intensity is a property of the elementary luminous ray; and it is only by a very common laxity of language that one speaks of the luminous intensity of a lighting apparatus. This confusion had no inconvenient results while the burners in use belonged to the Argand or the flat-flame types, because the diffusion over a sphere of radius unity being practically equal for all such burners, the total quantity of light emitted by them may be considered as sensibly proportional to the intensity of the horizontal ray, which is the only one actually measured. It is not so with recuperative burners. Knowledge of the luminous intensity of the horizontal ray, or even of any ray whatever taken by itself, is absolutely insufficient to indicate the total quantity of light emitted by the lamp." This conception is expounded in several pages of the report. It means practically that when the light given by different recuperative burners is measured in a determinate variety of directions—say, nine in all, as in M. Sainte-Claire Déville's tests—it is found to vary considerably. The partizans of these lamps naturally prefer to rate them at their best; but M. Cornuault argues that the mean spherical duty is the fairest datum whereon to compare this kind of lamp with open flames and with one another. So tested, they do not differ to any great extent in their duty, nor do they so far surpass the simpler forms of burner as appears to be the case where the measurements are taken in one particular direction. Moreover, the best effects of all are not given in the same direction, which is an important consideration in determining the most suitable pattern to adopt for a particular purpose. The report contains an elaborate set of tables and plates exemplifying this aspect of the question of lighting by gas.

M. Cornuault also has something to say about gas cooking and the ventilation of gas-lighted apartments; but this notice of his report cannot be further extended. We can, therefore, only repeat our expression of admiration of the way in which the work has been done by the experienced and fair-minded reporter, who has made a really useful addition to the literature of the gas industry.

DEATH OF MR. JOHN TAYLOR.

We regret to record the death of Mr. John Taylor, C.E., who was for many years a well-known authority on all matters connected with water-works. He was born at Monkwearmouth, Sunderland, in 1816; and came to the South of England in 1836. His first engagement was with the late Mr. Brunel, who placed him in charge of a section of the Great Western Railway permanent way, then in course of construction. In 1837, at the invitation of the late Mr. J. Simpson, Mr. Taylor assisted in the design and construction of the original works of the Chelsea Water Company. On their completion, he continued in Mr. Simpson's service, and in a few years became his principal assistant—a position which he retained until that gentleman's death in 1869. During these years Mr. Taylor prepared parliamentary schemes for a considerable number of the principal cities in this country, and also took a prominent part in designing the works, and seeing them carried to completion. Among other undertakings may be mentioned the Whittle Dene reservoirs, the construction of which was the first step taken by the Newcastle and Gateshead Water Company in connection with the water supply of those towns. Mr. Taylor was busily engaged in connection with the London main drainage inquiry in 1856; and he spent several months in gauging the flows of the various sewers, in which he had a complete staff of men working day and night. In the year 1869 he succeeded Mr. Simpson as Chief Engineer of the Lambeth, Bristol, Cardiff, Newport (Mon.), and many smaller water companies, which position, with the exception of that at Cardiff, he held till his death. In 1882 he was appointed Consulting Engineer to the New River Company; but last year enfeebled health compelled him to resign it. Mr. Taylor was a very facile writer, and had the gift of being able to state highly complex subjects in plain language. He was also an accomplished mathematician. After a brief illness, he passed away on the 3rd inst., admired for his ability as an engineer, and beloved for his courteous manners and generous character.

Ammonia as a Fire Extinguisher.—In a recent issue of *L'Union Pharmaceutique*, Mons. J. Jeanneau, a pharmacist at Savernay, relates how he successfully extinguished a fire which broke out upon his premises from the spontaneous ignition of gazoline, and which had for half an hour resisted the efforts of the firemen. He threw into the blazing apartment a glass carboy containing six litres of ammonia; and the flames, which were threatening to spread, were immediately extinguished—torrents of black smoke coming from the door of the room, but no fire. So thoroughly was the fire extinguished, that almost immediately it was possible to enter the room and remove an iron drum still containing 50 litres of gazoline.

NOTES.

Colour Photometry.

Captain Abney recently lectured before the Chemical Society upon "Colour Photometry;" illustrating his remarks by demonstrations of methods which he had devised, in collaboration with General Festing, not only for measuring the comparative luminosity of different parts of the spectrum, but also for accurately determining the "constants" of any colour. The constants of a colour are three in number—its hue, luminosity, and purity; and if these three qualities can be measured and expressed by numbers, it becomes possible to secure a permanent and complete record of any tint. The hue of a colour is best referred to the spectrum colours, and can therefore be expressed by the wave-length of the part of the spectrum with which it agrees. The luminosity of a colour is a measure of its brightness, and can be recorded by matching it against a surface of zinc oxide illuminated by white light to the same degree. By the term purity in colour is meant its freedom from admixture with white light; so that the lightest tint of any particular colour is that which is most lacking in purity. In order to compare one colour with another, it is absolutely essential that the light employed should be one giving a continuous spectrum; and early in his investigations, Captain Abney abandoned sunlight for the light emitted from the positive pole of a bright arc lamp. He regards such a light as practically a standard, and one which can be reproduced at will. Its spectrum is continuous; and the light is always of the same colour. From such a standard light a spectrum can be produced upon a patch of zinc oxide, and then any colour illuminated by the same light can be matched with the suitable part of the spectrum. Full particulars of Captain Abney's method, and of the apparatus which he uses, can be obtained from his book on "Colour Measurement and Mixture," in the Romance of Science Series of the S.P.C.K. The lecturer fully demonstrated that, with sufficient time and elaborate and expensive apparatus, colour measurements are easily made. He expressed a hope that the necessary apparatus will shortly be cheapened and simplified for the use of photometrists in general.

The Effect of Low Temperature upon the Soil.

It was remarked in the JOURNAL at the time, that the exceptional temperature conditions of the winter of 1890-91 ought to furnish some interesting data with regard to the protective capacity of layers of soil for pipes, &c., buried underneath the surface. A memorandum on the general subject was lately submitted by M. Henri Becquerel to the Académie des Sciences, from observations made at the Paris Museum of Natural History. It results from this memoir that the theory of Fourier represents very faithfully the propagation of heat in the superficial layers of the soil, and that one may deduce from observation of subterranean temperatures the coefficient of conductibility of these layers for determined conditions of humidity. A suitable thickness of soil protects roots of plants and other buried sub stances from sudden attacks of frost; but the same thickness will not be effectual as a protection against prolonged cold, although less intense, for then the lowering of temperature is propagated more slowly, it is true, but makes itself felt at a greater depth. The speed of propagation of a thermic variation, and the depth of soil to which such variation is able to make itself felt, depend upon its duration.

The Stability of Masonry Arches.

One of the first subjects of inquiry to arrest the attention of engineering students is the problem of the strength of masonry arches; and this is the problem of all others in construction which the most skilful engineer prefers to leave alone. The student very naturally has an idea that there must be some means of proportioning arches to their loads; but he soon learns that in practice this is never done. Brick arches are built of so many rings in thickness, according to the judgment of the designer as to what is required in the circumstances; and stone arches are also proportioned according to the dictates of experience. There is, of course, a theory of the arch—indeed, there are several theories—but in no drawing office is anything of the kind regarded otherwise than as simply a mathematical curiosity. It is now reported, however, that the Austrian Society of Engineers and Architects are engaged in a series of experiments having for their object the establishment of working rules for proportioning arches; and if their labours in this regard are successful, the Society will earn the gratitude of every engineer. Sufficient data have been accumulated in respect of the strength and elasticity of building materials and cements, it is believed, to render the theory of the elastic arch applicable to arches in masonry. The Society admit that masonry arches have usually been, and still are, designed "empirically"—that is to say, by the teachings of experience applied with judgment; and they confess that in most cases very little is known as to the actual stresses carried by structures of this order. It is probable that the factor of safety is very often excessive. The Austrian experiments will afford data as to the permissible working stresses; and, if so, the process of rationally designing arches will be greatly simplified. It may be gathered that the possibilities of cement concrete as a material for building in the form of the arch will be carefully investigated in the course of these experiments.

COMMUNICATED ARTICLE.

LIGHTING.

By W. H. Y. Webber.

PART II.—MODERN PROGRESS IN SCIENTIFIC LIGHTING.

(*Continued from p.* 990.)

The year 1879 opened and went on amid a great deal of so-called "competition" between gas and electric arc lamps. The brilliancy of the latter set the pattern for the power of the former; and these became more than lamps—they swelled into furnaces. It was proclaimed a triumph when the ever-waxing intensity of the new forms of gas-lamps culminated in a lantern showing a light demonstrably of 1000-candle power. This, however, was the climax; but before the new fashion in gas-lamps waned, it showed its brilliancy in most of the towns of the civilized world. Waterloo Place was lit up upon the improved system by Mr. William Sugg, for The Gaslight and Coke Company. This important thoroughfare had been lit, after a fashion, by burners consuming 2¾ cubic feet of gas per hour, giving the light of 9 candles. These were replaced by concentric Argands consuming 19 cubic feet of gas an hour, and giving a light of 80-candle power. The gas burnt in Waterloo Place is cannel gas of 20-candle power. This experimental lighting was subsequently extended.

In a notice of the experiment which appeared in the JOURNAL for Feb. 4, 1879, the subject of street lighting in general was very briefly discussed, in a manner that would have been regarded as superfluously critical only a year earlier. In this article it is remarked: "In determining the amount of illumination sufficient for all purposes, the circumstances of each case should be judged upon its merits. All roads do not require to be lighted to the same extent, nor even all parts of the same road. Wherever considerable traffic is carried on after dark, good lighting is a necessity; and it may be that such lighting would be a wasteful extravagance elsewhere. Also at the intersections of streets, at busy corners, and in such places as Piccadilly and Oxford Circuses, powerful centres of light would be of the greatest advantage. For an ordinary street or road, it will probably be found that a number of smaller lights closer together are to be preferred to fewer lights of greater brilliancy. The shorter the distance between light and light, the less loss of light takes place. Lights equal to 16-candles in illuminating power, placed 20 yards apart, are equal, in the general illumination of a thoroughfare, to lights of 25 candles placed 25 yards apart." These observations were distinctly opposed to the tendency of the improved public lighting of the day, which, as already shown, was led by the example of the electric arc lamps to the concentration of illuminating power in a few brilliant centres. It appears, from the article quoted, that the opinion of the critical JOURNAL writer with regard to the Waterloo Place display was that the lighting was overdone, and that Mr. Woodall's experiment on the south side of the river was to be preferred. Indeed, it may be stated as somewhat curious that the JOURNAL mentioned with high encomium Mr. Sugg's temporary improvement of the lighting of Waterloo Place by using instead of the old gas-burners, 6-feet Argands, giving a light of 24 candles, which was brilliant enough to enable small print to be read 25 feet from the columns.

About the same period, Dr. William Wallace gave a lecture at the Society of Arts upon "Gas Illumination;" and it is a striking commentary upon the progress that has been made during the past decade in gas-burner construction, to observe that, speaking in 1879, Dr. Wallace explained, as a matter of course, that the statutory rating of coal gas as of 16, 18, or 20 candle power, and so on, merely showed "the possibility of gas illumination, and represented the goal towards which we should strive." He admitted that it was "impracticable, not to say impossible, to obtain, in the every-day practice of common life, results as good as those got by means of appliances the most perfect for developing the full photogenic value of the gas." Now-a-days, any gas consumer can, by the use of a recuperative burner, obtain very much more light from his gas than its nominal illuminating power.

Dr. Wallace's lecture is otherwise noteworthy as containing a valuable expression of opinion respecting the real requirement of street lighting. He was moved by the Waterloo Place display to remark that "we are striving too hard to light up our streets brilliantly." "I do not see any necessity," the lecturer went on to say, "for lighting up the streets to such an extent as to make them equal to daylight. What we want is simply to see where we are going, to avoid being robbed at night, and so on. Therefore, I think it is a great mistake to strive to make our streets as light as they are during the day." Dr. Wallace's protest was supported by Mr. Silber. All pleas for moderation in the amount of light exhibited in the streets were, however, disregarded for the next two or three years. Intense lights were the rage.

In Paris, the Gas Company devised some high-power lamps which were afterwards known by the name of the street—the Rue du Quatre Septembre—where they were first shown in juxtaposition to the Jablochkoff lights in the adjoining Avenue de l'Opéra. Here 30 of the ordinary street gas-lamps were supplanted by 80 of a larger model, bearing clustered flames consuming 1400 litres of gas per hour, or seven times the previous consumption per lamp. The illumination of the street was just

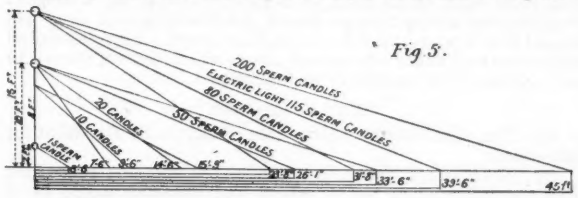
32 times greater under this system, and was perhaps the most extravagant piece of street lighting in the world.

The Victoria Embankment was at this time lit by the Jablochkoff system. According to an address of the late Mr. R. P. Spice to the Society of Engineers, the length of thoroughfare covered by the Jablochkoff lights was 1170 yards, served by 20 lamps. The Embankment is about 100 feet wide. It was previously lighted by 170 gas-lamps, to which Mr. Spice ascribed the not extreme brilliancy of 8 candles. At Westgate-on-Sea, Jablochkoff lamps were used at an average distance apart of 80 yards. In an experiment at the Liverpool Street Station of the Great Eastern Railway, Wallace arc lights were used at 37-yard intervals. This represented the best ideas of the day with regard to lighting.

Up to this time, nobody had made any attempt to define the amount of artificial light really needed for various purposes. Electric lights, where used, were simply put as thickly as those making the experiment could afford—just as when street gas-lamps were in question, these were scattered as sparsely as public opinion permitted. It is true that calculations had for the first time been published, showing the quantity of light given by different systems of outdoor illumination; but no pretence was made of showing how much practical lighting effect was produced by the method of distribution. At the meeting of the British Association of Gas Managers in 1879, Mr. W. Sugg read a paper on "Lighting by Gas and Electricity," which essayed to deal with this very question. He remarked that, when returning to the first principles of street lighting, the standard that suggests itself is the old-world spectacle of a man lighting his way with a lantern held in front of him by a stick. He said:

The height of the lantern from the ground is just 2 feet to the centre of the flame. If the lantern is provided with a parliamentary standard candle, it will, in the position I have stated, light a circle of 4 feet in diameter. The amount of light anywhere on the edge of this circle will be sufficient to enable a man with good eyes to read a leading article in *The Times* newspaper lying on the ground. This light will just enable a man to see his way before him as he walks. In a well-lighted neighbourhood, where the local authorities allow to each lamp 5 cubic feet of gas per hour, and there are no shops, this is the average kind of light which is found at 7 ft. 6 in. from the lamp-post. The lamp is 10 feet from the ground. . . . I have here a diagram which will show the effect of the present as well as of the improved gas lighting, and the effect also of the electric lighting for streets. Besides this, it affords a guide by which you may be able to arrive at some practical conclusions as to the proper height of posts in regard to the light in the lantern. You see that as the height of the post is increased, so the illuminating power of the lamp must be increased also. The diagonal lines in the drawing show where the standard light of one candle is given. This diagram is intended to show where the standard amount of light will be given on the ground by street lamps of the power of 10, 20, 50, 80, 120, and 200 candles; it will also show the most suitable height of post for these different burners. The lowest spot on the vertical line which represents the post is 2 feet from the ground; the next highest spot is 10 feet from the ground; and the highest spot is 15 feet from the ground. This is the height of the columns on which the electric light is fixed in the Avenue de l'Opéra.

Fig 5.



Now let us make an application of this diagram to practice. A 5 feet per hour ordinary street gas-lamp gives the standard of light of one candle carried by the pedestrian, at 7 ft. 6 in. from the lamp-post. It is, therefore, clear that 10 feet is too high for such a weak light. On an 8-feet post, the same light will give us the standard light on the ground at nearly 10 feet from the post; a 20-candle burner will give us the standard light on the ground at 14 ft. 6 in. from the post; a 50-candle burner, at 26 feet; an 80-candle burner, at 33·6 feet; an electric light, at 39·4 feet; and a 200-candle burner, at 54 feet. All these are direct rays, without reflector of any kind. If a good white glass reflector be put over the gas-burners, they will give at least 50 per cent. more light, and the distance to which they will send the standard quantity of light will be one-quarter of the horizontal distance more than without the reflector.

An interesting paper on "The Application of Gas to the Lighting of Open Spaces and Large Buildings," was also read by Mr. Sugg before the above-named Association in 1882; and it will be found worth perusal in connection with the subject now under consideration.

The next point that calls for notice in the development of street lighting is the Birmingham trials of improved gas-lamps conducted by Mr. Charles Hunt, with the assistance of Mr. Alfred Colson, through the initiative of Mr. Alderman Chamberlain. These tests, however, went to the selection of the best burner, and not to the determination of a standard of lighting. The most notable experiment involved comparative tests of nominal 200-candle power lamps 150 feet apart. These trials were followed in due course by a conspicuous improvement of the gas lighting in the central parts of Birmingham, according to a plan published in the JOURNAL at the time (see Vol. XXXVI., p. 846). In this specimen of improved street lighting, Mr. Hunt wisely attended to the necessity for distribution, and did not use any burner of greater capacity than 10 cubic feet per hour. The actual quantity of light in the darkest part of the roadway opposite the Birmingham Council House was not measured; but the irregular reflection of light from the surfaces of the surrounding freestone buildings, when new, must have materially increased the brilliance of the general effect.

(To be continued.)

TECHNICAL RECORD.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

We complete to-day the report, commenced last week, of the proceedings at the recent quarterly meeting of the above Institution.

Discussion on Mr. West's Paper.

The PRESIDENT having invited Mr. W. A. Valon to open the discussion on Mr. West's paper on "Stoking Machinery, &c." (see *ante*, p. 1043),

Mr. VALON said he accepted the President's invitation with more pleasure because he thought the members of the Institution knew his opinion with regard to the latter part, if not the former part, of the paper. The first portion treated of the extension of the consumption of gas by companies judiciously encouraging it in their districts. Well, he was able to say a little on this subject from the fact that at Ramsgate they had, during the last two years, done more in this direction than before. They commenced by putting pipes in small houses—those with a rateable value below £30. They did this because they found that gas was not being burnt in houses where it ought to be used, as the occupiers could not afford to put in the pipes. He made inquiries, both personally and through the meter inspectors; and as the result, he recommended the Corporation of Ramsgate to undertake to fit up houses with a rental of from £10 to £30 per annum. This was done—a prepayment meter being used; and they charged for the gas consumed at the rate of 4½d. per 100 cubic feet, or 7d. per 1000 cubic feet more than to the ordinary consumers. A considerable number of houses were fitted up. The inspectors found that some people burnt more than double the quantity of gas paid for in advance; and the outcome of this was the adoption of a stop-index. This was turned forward to stop at any quantity the consumer pleased; and the money was paid in advance for this quantity—the difference being adjusted when the inspector next called, and the index reset. Of course, these meters were used for the smaller rather than the larger houses. Their next step was to lend consumers small boiling-stoves free of cost; and in some cases this had led to the purchase of larger cooking-stoves. The result was that they had 538 small consumers on this system in less than two years. The average cost of fitting up the houses was a little more than £3. This was not a serious matter; for if they fitted up a thousand houses it only cost £3000. The wear and tear was very little. They used fast brackets, and did not go in for elaborate chandeliers, or anything of that kind. Mr. West had referred to the difficulty of getting the control of the fittings into the hands of corporations and companies, and to the conflict into which they got with the fitters. This difficulty they overcame at Ramsgate by an arrangement that the gas-fitters who would undertake, at scheduled prices, to fit up these houses should be allowed to do so; the work being given out fairly amongst the whole number, on the condition that they should do their work under the inspector, and to his satisfaction. They also said to the gas-fitters: "If you bring anyone who requires his house fitted up on this system, the work will be yours, as a matter of course." The consequence was the fitters were satisfied, and so were the Corporation. All he need add, with reference to the other subject mentioned in the paper, was that the manual stoking-machines they had in use at Ramsgate had given entire satisfaction. The wear and tear was exceedingly light. The advantages of machinery were set forth fairly and truthfully in the paper; and he, as an Engineer, rejoiced to find that it was pushing its way into gas-works. So long as men were willing and their labour was cheap, they had been content to take things as they were. But circumstances had changed; and he thought they might now adopt machinery, and at the same time retain the good-will of the men. His testimony was that, taking it all round, there was no machinery—and this applied especially to the manual machinery—on which he should place so much reliance as on that of Mr. West.

Mr. W. R. CHESTER (Nottingham) said the subject of the paper was one in which they were all more or less interested; indeed, they ought to be more so than they were. The title might perhaps have been altered to "On Things in General," for Mr. West had something to say on the subject of electric lighting, manual and power stoking-machines, distribution, and the general management of gas-works, on all of which questions he was able to express a very reliable opinion. As to machinery, very few people would now deny that a large saving could be effected by its use. Of course, power machines were best, provided the works were large enough to justify the expenditure of the capital necessary to provide them. Where the works were not sufficiently extensive to utilize power machines to

advantage, hand machines could be worked at a saving of 1s. per ton of coal carbonized; while if power machines could be introduced, there was a further saving of something like 30 per cent. In Manchester they had both. They were working first with considerable economy with the hand machines; but when the power machines were put in, the cost of stoking was reduced something like 30 per cent. He understood from Mr. West that this result had not only been confirmed, but had been improved upon in some places. A reduction of 1s. per ton on the total quantity of coal carbonized was such a considerable sum, that everybody should feel compelled to effect it if possible. At Nottingham most of the retort-houses were so constructed that machinery could not be used in them; and they had to continue on the old lines. As to the electric light, he did not agree with Mr. West that the owners of gas-works should not undertake its supply. The time had now come when both large and small towns would demand that the new light should be introduced; and the cost would not stand in the way of people who desired to have it on their premises. In certain directions, it undoubtedly possessed advantages over gas; and if it was to be employed, who could supply it better or more reasonably than the manufacturers of gas? If there were two lighting bodies in a town, they would get into competition; and although the consumers would ultimately reap the benefit, the town at large would be subjected to great disadvantage. He held with what was being done by many corporations throughout the country who had placed the power to supply the electric light in the hands of the gas committee, so that, if any profits were to be derived from it, they could be set off against any possible loss of revenue from the sale of gas.

Mr. J. Chadwick (Oldham) said he did not understand Mr. West's remarks about electric lighting as Mr. Chester did. What he understood Mr. West to say was that, in the event of a corporation undertaking to supply the electric light, it should be kept as a distinct account, just as the accounts of water-works were now kept separate from those of gas-works in a combined undertaking. In this, he agreed with Mr. West. If corporations were to undertake to supply the electric light—and he was far from saying they should not do so—the accounts ought to be kept quite distinct from all others. There were several reasons why corporations might desire to supply the light, in the event of its being required in a district. One was that they might keep in their hands the control of the roads and streets, which was a very important matter to local authorities. Referring to the question of machinery, there were many reasons why gas managers had felt compelled to adopt labour-saving appliances; and in every case he believed their use had been beneficial. The coal haulage machinery which they laid down had, no doubt, proved a very great saving and convenience to the Oldham Corporation Gas Committee. It was about twelve months since they erected the first part of the apparatus; and since then it had been working continuously, and they had had no trouble with it. It had done its work well, and had never gone on strike. They had two machines erected, each capable of doing all their work, or even more; and they were in this position—that, if one was temporarily stopped, they could turn to the other. One of the machines was now regularly dealing with between 200 and 300 tons of coal per day; and it had dealt with 30,000 or 40,000 tons, and had never cost a penny for repairs. It might be thought that belts working among so much coal-dust would become affected. They had not found this to be the case, though, of course, they took a great deal of trouble to avoid it, by seeing that the belts were kept clean and well oiled. They accomplished work at present with three men which used to take twenty. The machinery was giving every satisfaction; and it would not be the last labour-saving appliance they would adopt. He had an idea that haulage machinery might be employed for coke as well as coal; and he hoped before long to be able to use stoking machinery also.

Mr. H. Simmonds (Colne) said that for several years he had experience of stoking machinery at Cheltenham. There they had a retort-house with twelve beds, 96 retorts on one side, and a make of 1½ million cubic feet; and double machinery was laid down. The chief point, in his experience, was that machinery could be adopted in smaller works with equal success. At Colne they had a make of about half a million cubic feet of gas per day; and there they had a single retort-house with only one set of machinery. This had been running for about two months; and he had obtained a few figures as to the result. The house was not quite finished. It was designed for twelve beds of eight retorts; and they were now working eight beds. They carbonized 250 tons of coal per week; and they had nine stokers at 32s. a week, two firemen looking after the regenerator furnaces, two engine men at 28s. a week, and two coke men,—the total cost being 1s. 9¾d. per ton. If they had been working by hand, they would have required fifteen stokers, two firemen, four coke men, and two coke wheelers; and the average then would have been 2s. 8d. per ton. So that he was saving nearly 1s. per ton; and besides this the stokers did the work much quicker, and increased results were accordingly obtained from the coal. This went into the retort in a body, and before it had time to start carbonizing, the lid was on; whereas under the old system it was carbonizing as it was thrown in by shovelfuls.

The President, in closing the discussion, remarked that the members were indebted to Mr. West for a very practical and useful paper. No man had had more experience in the retort-house than Mr. West, who had given much study to the question of reducing to a minimum the labour in that part of the works. He was, they had heard, working as low as 1s. 4d. per ton. He (the President) only wished he could get down to this figure; it would pay for a good many machines. He was very glad to hear that Mr. Valon was making such good progress in popularizing the use of gas. The facts he had brought before the meeting were very encouraging. At Birkenhead they had a large number of houses in which oil was burned; and so far they had not succeeded in getting at them. A few years ago he tried to do something of the kind; but it was crushed out by the Town Council, because of the small local interests which it was thought it might injure. He did not think his plan would have been any disadvantage to these people. If it had been, they were very few; and the majority ought to rule. The discussion on the subject of public bodies and the adoption of the electric light would, he supposed, always go on. His idea was that it was the proper course for corporations to obtain the necessary powers for supplying the light, and either carry them out themselves, or delegate them to a company. They must look upon the electric light as a competitor; but, if they took it up in a fair spirit, they had nothing to fear. It was a very long way behind in the matter of cost; but there were some people in all towns who would have it, no matter what the expense might be.

Mr. West, in reply, said the example of Mr. Valon in extending the use of gas might be followed by others. By employing a prepayment meter, he was paid by the small consumers before the gas was delivered; and he further popularized the use of gas by lending stoves free of cost. This was his (Mr. West's) idea exactly; for he believed that, if the claims of gas were put forward on businesslike lines, the result would be found to be satisfactory. Mr. Valon had also solved the problem of satisfying the gas-fitter. Mr. Valon's use of machinery was coincident with his attempt to popularize gas; and the result was that he had had to order more machinery. Perhaps no one had had greater experience of stoking machinery in Manchester than Mr. Chester; and he had correctly told the meeting the advantage of power over hand machinery. He had, however, misunderstood his (Mr. West's) reference to the electric light. He had no objection whatever to corporations taking up the light; but, if they did so, they should supply it on commercial lines. They should allow all people to have it who wished, and let them pay for it. If it displaced gas, it would not then matter, because they would be getting the same profit out of electricity. At the same time, if they took a leaf out of Mr. Chester's book, and fitted up public buildings, as he had done those at Nottingham, with regenerative lamps, and paid attention to the ventilation, the electricians would have very little show. He (Mr. West) was glad that Mr. Chadwick was present, and that they had heard his statement about the electric light. Mr. Simmonds had told them of his experience at Cheltenham, and also at Colne, where, with very small works, he had, by using machinery, reduced the cost from 2s. 9d. to 1s. 9d. per ton of coal carbonized. Mr. West went on to refer to a picture in that day's *Graphic*, representing a retort-house where machinery was in use. He stated that it was a most incorrect illustration, for it represented stokers as half naked—a state of things which did not prevail in any works where machinery was employed.

Vote of Thanks.

Mr. Chester moved a hearty vote of thanks to Mr. West for his paper.

Mr. T. Duxbury (Darwen) seconded the motion; remarking that the information the members had obtained would be of great use to them. He added that there was no stoking machinery at the Darwen works; but the time was not, he thought, far distant when there would be.

The resolution was carried, and the formal proceedings then ended.

THE GAS UNDERTAKINGS RETURNS.

The returns relating to the gas undertakings of the United Kingdom—for the year ending Dec. 31, 1890, in the case of the Companies, and March 25, 1891, in that of the Local Authorities—were issued last Friday. As they were not ordered by the House of Commons to be printed before the 4th of August, less time has elapsed than in previous years between the order and the publication. We give below the principal figures.

The returns furnish particulars in regard to 416 authorized gas undertakings belonging to Companies, as compared with 405 for the year 1889. Two of these are in Scotland and nine in Ireland. Local Authorities to the number of 178 (an increase of five) sent particulars relating to their undertakings; and of these 141 are situated in England and Wales, 32 in Scotland, and 5 in Ireland. The total amount of capital authorized for these 594 gas undertakings is £77,519,068, of which £61,344,357 has been paid up and borrowed. The total receipts are £17,300,128; the expenditure is £13,149,086. With regard to the working statistics, the quantity of coal and cannel carbonized in the periods covered by the returns was 10,242,427 tons; the volume of gas produced therefrom being 103,011,038,299 cubic feet, of which 94,645,613,186

cubic feet were sold. There are 21,969½ miles of mains in use for the supply of 2,297,278 consumers and 460,384 public lamps. Although the returns from the Local Authorities are mostly made up to March, in some cases the financial year closes at a different date, which is indicated. In a few instances, no information can be given as to the make of gas; while estimates only are sent as to the quantity used for the public lighting and also the length of mains. In the last-named particular, the Companies fail in seven cases; though this is a very low figure in comparison with the year 1883, when it was 46. In a few other matters—notably as to the supply of gas for public lighting—estimates only are returned. The amount of capital authorized for gas undertakings in the hands of both Companies and Local Authorities includes, in some instances, other purposes, such as water supply.

Comparing the foregoing figures with similar returns for previous years, it will be seen that the capital obligations of the Companies are as follows:—

Year.	Share and Premium Capital Paid up.	Loan Capital Issued.	Capital Sold under Auction Clauses.	Premiums Realized.
1882. . .	£28,589,148	£4,345,787	£2,065,905	£957,561
1883. . .	29,038,726	5,075,804	2,538,709	1,088,675
1884. . .	29,594,464	5,330,550	2,810,415	1,188,750
1885. . .	30,109,429	5,404,141	3,088,460	1,306,238
1886. . .	30,960,026	5,679,830	3,209,564	1,393,773
1887. . .	31,556,788	5,839,792	3,354,093	1,473,656
1888. . .	31,736,024	6,002,510	3,488,588	1,517,902
1889. . .	32,117,202	6,090,546	3,641,730	1,563,595
1890. . .	32,884,026	6,568,676	4,008,465	1,765,557

Some of the other comparative details in the Companies' returns are—

Year.	Tons of Coal Carbonized.	Cubic Feet of Gas Made.	Number of Consumers.	Public Lamps Lighted.
1882. . .	4,928,695	49,360,289,059	1,055,009	224,300
1883. . .	5,171,963	52,330,749,963	1,091,388	235,338
1884. . .	5,361,576	54,452,255,864	1,102,628	242,782
1885. . .	5,595,371	56,903,060,785	1,115,223	250,404
1886. . .	5,777,966	59,051,111,814	1,133,897	258,072
1887. . .	5,977,254	61,266,055,857	1,152,119	264,316
1888. . .	6,050,588	62,328,542,470	1,103,198	259,921
1889. . .	6,309,495	64,627,914,489	1,128,838	268,013
1890. . .	6,618,460	67,214,546,500	1,153,989	275,611

The somewhat similar figures for the Local Authorities are—

Year.	Amount Borrowed, including Annuities (not deducting Repayments).	Receipts.	Expenditure (exclusive of Amount in next Column).	Interest, &c., Paid.*	Net Profit after Payment of Items in preceding Column.
1882. .	£17,326,183	£4,098,828	£2,759,304	£845,936	£510,268
1883. .	17,874,351	4,252,296	2,877,732	873,921	524,010
1884-5 .	18,758,895	4,334,059	3,066,386	894,836	399,714
1885-6 .	19,619,416	4,348,105	3,117,989	901,773	355,469
1886-7 .	19,723,046	4,403,262	3,127,047	951,636	359,532
1887-8 .	20,081,435	4,495,093	3,161,604	923,157	439,467
1888-9 .	21,333,833	4,817,269	3,375,197	977,154	479,489
1889-90 .	21,669,789	5,067,843	3,627,578	971,755	486,483
1890-91 .	21,891,655	5,628,212	4,231,643	956,183	460,608

* These figures include: (1) Interest paid on loans; (2) amount paid for annuities (3) amount of loans repaid; (4) amount paid for redemption of annuities; (5) amount placed to sinking fund.

Year.	Tons of Coal Carbonized.	Cubic Feet of Gas Made.	Number of Consumers.	Public Lamps Lighted.
1882. . .	2,352,062	23,223,054,342	916,962	137,011
1883. . .	2,459,341	24,507,217,850	928,458	140,198
1884-5 . .	2,642,942	26,120,491,840	955,728	144,506
1885-6 . .	2,783,533	27,734,666,850	979,802	151,670
1886-7 . .	2,879,765	28,880,425,240	996,480	155,849
1887-8 . .	2,985,577	30,105,457,962	1,011,139	159,264
1888-9 . .	3,204,982	32,381,124,770	1,089,748	174,191
1889-90 . .	3,353,516	33,453,368,830	1,115,267	178,867
1890-91 . .	3,623,967	35,796,491,799	1,143,289	184,773

Royal Institution.—The Friday evening meetings which will commence at the above Institution on the 22nd prox. will be opened with a discourse by Lord Rayleigh on "The Composition of Water."

"Hazell's Annual for 1892," a copy of which has been forwarded to us by the publishers (Messrs. Hazell, Watson, and Viney, Limited, of Creed Lane, E.C.), has reached its seventh year; and each succeeding issue appears to strengthen the claim it puts forward to being "a cyclopædic record of men and topics of the day." The present volume contains a great deal more matter than its predecessors; and it is all arranged so as to facilitate reference. Having been revised to Nov. 20, and a list of occurrences during printing being given as an addendum, the information furnished may be regarded as quite up to date; and therefore the book will be found most useful in every office.

AMERICAN GASLIGHT ASSOCIATION.

The Annual Meeting in New York.

(*Continued from p.* 1042.)

The reply of Dr. Wilkinson to the discussion on his paper on "Lime" brought the first day's proceedings to a close. On the resumption of business the next morning, Professor E. G. Love read the following paper:—

THE ILLUMINATING POWER OF MIXTURES OF COAL AND WATER GASES.

At the meeting of the Association at Baltimore, in 1889, the question was raised whether the illuminating power of mixtures of coal and water gases was higher than the average of the two gases tested separately. In accepting the invitation of your Committee to prepare a paper for this meeting, it occurred to me that possibly a few remarks on this subject might be as acceptable as anything I could offer.

The question naturally divides itself into two parts: (1) Is the advantage which has been claimed for mixtures of the two gases sustained by experiment? (2) If it is, what explanation can be offered for this increased luminosity?

My first thoughts naturally turned to a speculation as to what, from a theoretical standpoint, would be most likely to be the case; but, as might have been expected, the results were not satisfactory. This arises, mainly, from the fact that our knowledge at the present time is not sufficient to warrant us in attempting any prediction as to the luminosity of a gaseous mixture from its analysis; and yet I think this phase of the question, as well as certain collateral matters, are not wholly without interest.

The determination of flame temperatures by experiment is attended with many difficulties, and our knowledge of this subject is very meagre. For purposes of comparison, recourse is often had to a calculated flame temperature based upon the composition of the gas and the products of its combustion. These calculations probably do not give us an approximation even to the temperature actually produced in a gas-flame, for the reason that we have no knowledge of specific heats of gases at high temperature, as well as on account of the dissociation which must take place in the flame. They give, however, a theoretical temperature which, although of a merely relative value, we may often use with advantage.

Accepting Davy's theory that the luminosity of a gas-flame is due to the incandescent carbon particles, it follows that a high flame temperature which increases the incandescence of these particles will give greater luminosity to the flame. It is, therefore, often supposed that there exists in illuminating gases some direct relation between flame temperature and luminosity. There are other conditions, however, which render this relation very uncertain.

Dr. P. Frankland has found that ethylene, burned by itself, gives a light of 68·5 candles; and that a mixture of 75 per cent. of ethylene and 25 per cent. of oxygen has a luminosity of 74 candles. Here the oxygen gives a more intense combustion, the flame temperature is higher, and greater light is obtained. With ethylene alone, the calculated temperature is 4921·6°; while the mixture with oxygen reaches 7350·8°. The same authority has found that of the three diluents, hydrogen, marsh gas, and carbonic oxide, the marsh gas is the most valuable medium for carrying the heavy hydrocarbons, and that hydrogen is next. A mixture of 75 per cent. of marsh gas and 25 per cent. of ethylene gives about 26·5 candles; while if the marsh gas is increased to 92 per cent., the mixture still has a luminosity of 17·6 candles. All mixtures of marsh gas and ethylene, therefore, furnish light—a fact which is in marked distinction from similar mixtures with hydrogen and carbonic oxide. A mixture of 75 per cent. of hydrogen and 25 per cent. of ethylene gives about 22 candles; but when the percentage of hydrogen is increased to 90, the mixture ceases to be luminous. A gas composed of 75 per cent. of carbonic oxide and 25 per cent. of ethylene gives only about 8 candles; while a mixture containing 80 per cent. of carbonic oxide and 20 per cent. of ethylene gives no light whatever. In other words, 10 per cent. of the ethylene is lost when mixed with hydrogen; and 20 per cent. when mixed with carbonic oxide.

The flame temperatures of mixtures of 25 per cent. of ethylene with 75 per cent. of marsh gas, hydrogen, and carbonic oxide respectively are 4557° for the marsh gas mixture, 4878° for the hydrogen mixture, and 5127° for the carbonic oxide mixture; or the one having the highest calculated temperature is lowest in luminosity. Carbonic oxide consumed alone is non-luminous; but it has a high flame temperature. This arises from the fact that, while its calorific power is low, the quantity of air required for its combustion is also small, as are likewise the products of its combustion. The high temperature raises the carbon particles of an added hydrocarbon to a greater degree of incandescence, and consequently produces a whiter light, but at the same time burns a larger proportion of the carbon without the production of any light whatever. Hence the higher flame temperature with greatly reduced luminosity.

In the case of marsh gas, its flame temperature is about the same as that of carbonic oxide; for while the air consumed and products of combustion are greater, they are counterbalanced by the much larger quantity of heat yielded. In its mixture

with ethylene, it has its own carbon as well as that of the ethylene to heat. A less proportion of the carbon is lost; but the flame temperature is lower, and the carbon particles are not heated to the same degree of incandescence as in the case of carbonic oxide. The latter is therefore better able to carry an excess of heavy hydrocarbon than is marsh gas.

For the purpose of comparison, I have taken the following analyses of coal and water gases, to which I have added a third, representing a mixture of the two in equal volumes :—

	Coal Gas.	Water Gas.	Mixture.
Hydrogen	39·78	29·16	34·470
Marsh gas	45·16	24·42	34·790
Carbonic oxide	7·04	28·33	17·685
Ethylene	4·34	12·46	8·400
Ethane	—	0·78	0·390
Benzol vapour	2·04	2·88	2·460
Carbonic acid	1·08	—	0·540
Oxygen	0·06	0·21	0·135
Nitrogen	0·50	1·76	1·130
	100·00	100·00	100·000
Specific gravity, calculated	0·4644	0·6551	0·5597
Calorific power, heat units	19233·6	13913·6	16114·4
Air required for combustion of 1 lb. of gas . . lbs.	14·70	10·22	12·08
Products of combustion from 1 lb. of gas . . „	4·37	3·32	3·75
Flame temperature . .	4555·80°F.	4760·50°F.	4657·30°F.

While any comparisons of these figures must be taken with some allowances, it appears that the air required for the combustion of 1 lb. of the mixture is less than the average of the two component gases. The products of combustion are also a little less than the average; and both are favourable to the mixture. At the same time, the calorific power of the mixture is less than the average, which is unfavourable; while the calculated flame temperature is practically the same as the average of the two gases. From a study of the question from this standpoint, I have been unable to find any grounds for supposing that the luminosity of the gaseous mixture in question would be greater than the average of the two component gases.

I think I must admit that the experimental part of my case is a little weak—not from the nature of the results obtained, but rather from the number of tests I have been able to make. This arises from the fact that it was necessary to take the coal gas at the works of the Consolidated Company, and transport it to the laboratory in cylinders under pressure. The only objection to this plan was the rather limited supply of coal gas at my disposal. The gas was transferred from the cylinder to a holder before use; and the mixture used consisted of equal volumes of coal and water gases. Extremely uniform results were hardly to be hoped for, inasmuch as the final result was based upon the tests of three different gases, with the possibly accumulated errors of each.

In nearly all cases, several tests were made of each gas; and the average was taken. In the first experiment, the coal gas tested 16·61 candles; the water gas, 28·73 candles; the mixture, 23·08 candles—a gain of 0·41 candle over the average. In the second case, the coal gas gave 17·33 candles; the water gas, 29·04 candles; the mixture, 23·15 candles—a loss of 0·03 candle. In this experiment, the coal gas may have contained a very small percentage of water gas. The next test gave 18·04 candles for the coal gas; 28·86 candles for the water gas; and 23·13 candles for the mixture—a loss of 0·32 candle. The last test showed 18·16 candles for the coal gas; 27·84 candles for water gas, and 23·24 candles for the mixture—a gain of 0·24 candle.

While I shall hope to extend these experiments before arriving at my final result, I think the tests already made furnish reasonable ground for the opinion that the illuminating power of mixtures of coal and water gases is practically the same as the average of the two tested separately.

(*To be continued.*)

"Electric Lighting of Houses" was the title of a lecture delivered last Thursday evening by Mr. F. Grant Ogilvie, M.A., Principal of the Heriot Watt College, Edinburgh, to the members of the Dundee Institute of Architecture, &c. The lecturer dealt first of all with the nature of the light, and then proceeded to explain its distribution in houses, its effective utilization, the basis of its measurement, and its cost. The fittings required for domestic electric lighting were described; and the whole subject was practically illustrated.

Detection of the Contamination of Water with Sewage.—In a recent number of the *Chemical News*, there was a notice of the process introduced by Herr P. Griers for the above-named purpose, as described by him in the *Berichte Deutsche Chem. Gesell.* The author dilutes paradiazobenzol sulphuric acid with 100 parts of water, and adds a little soda-lye in excess. The solution must always be used when fresh, as it soon becomes coloured spontaneously. The water to be examined is placed in a tall cylinder of colourless glass, holding about 100 c.c., which is stood upon a white surface before a window. To the water are then added from 2 to 4 drops of the diazo solution. The whole is well stirred up, and it is carefully observed. If no change of colour takes place within five minutes, it may be inferred that there is an almost entire absence of organic excretions or products of decomposition. A yellow colour more or less decided shows the presence of a certain quantity of such matter.

DETERMINATION OF THE EFFICIENCY OF COAL.

By Dr. H. Bunte.

[Translated from the *Journal für Gasbeleuchtung.*]

As I have shown by previous experiments, there is one point especially to be considered in coal with respect to the gas industry —viz., its qualification for making gas and coke, or, in other words, its "gas-value." I have shown that the latter not only depends upon the quality and the elementary composition of coal, but essentially on the conditions under which distillation takes place; for instance, whether the temperature is high or low, and heating is rapidly or slowly performed. Moreover, I have mentioned how difficult it is to judge of the quality of gas coals from elementary analysis, so long as there exist any doubts about the relations between the latter and the quality of coal which is shown by its calorific power or heat of combustion. While the distillation of coal is a very complicated process, in which numerous and partly unknown chemical compounds are formed and decomposed, in burning coal all organic compounds are split up into their simplest constituents, and carbonic acid and water are formed under simultaneous evolution of heat. Therefore, it is only by explaining the relations existing between the calorific power of coal and its elementary constitution, that we shall be able to solve further questions.

With regard to the relations existing between the calorific power of coal and its chemical composition, there have lately been put forward various contradictory views, in consequence of which it appeared to be necessary to make fresh experiments to settle the question. Before describing these experiments, I wish to mention similar ones which have been previously undertaken. Up to about 1865, there were no experiments of any importance recorded on the heat of combustion of coal. On its evaporative power, however, there existed some very elaborate experiments in America,* England,† Germany,‡ and France; § but as there always will be found, to a greater or less extent, a loss of heat inevitable in all boiler plants, owing to radiation and conduction, these experiments showed anything but the true value of the heat stored up in coal.

Taking the calorific power of coal as depending upon its elementary composition, the heat of combustion was calculated after the so-called Dulong formula (or a similar one)—

$$C\ 8080 + \left(H - \frac{O}{8}\right) 28{,}800 + 2500\ S - 600\ W.$$

According to this, the heat of combustion of any organic compound is supposed to be equal to the different heats of combustion of all its elements together. If a material contained oxygen, as is the case with coal, this oxygen was supposed to have formed water with one part of hydrogen present, which, of course, impaired the evolution of heat. This formula, no doubt, cannot claim to be a thoroughly scientific one, as many of the suppositions under which it has been formed will not hold good. For instance, the carbon of coal is not present as charcoal, the heat of combustion of which is supposed to be 8080 calories. Moreover, hydrogen is not in a gaseous state; and water is not really formed, as is supposed to be the case in adopting this formula. Consequently, the calorific power of coal, calculated after Dulong, was not much relied upon; but there were no experiments which proved the contrary, and showed the extent of deviation of the ascertained results from their real value.

In 1867, Scheurer-Kestner and Meunier, at Mulhouse, made some experiments on a small scale, to find out the heat of combustion of coal by using an apparatus similar to the calorimeter invented by Favre and Silbermann, which was specially constructed for this purpose. By these experiments the heat of combustion was found to be not only from 10 to 17 per cent. higher than was shown by the Dulong formula, but it proved to be even higher than the sum of the heats of combustion of the carbon and hydrogen elements together. In consequence of this, Scheurer-Kestner asserted that there was no relation whatever between the elementary composition of coal and its calorific power. Thus the chemical analysis of coal, which had hitherto been used to determine its approximate calorific power, lost some of its value; and there was no substitute for it to enable one to ascertain the heat of combustion in a practical way. For Scheurer-Kestner's method was only practicable by using very small quantities of coal (0·3 to 0·5 gramme); on the other hand, it required very exact apparatus, and complicated physical methods, for working them.

In the meantime, doubts were expressed as to the correctness of Scheurer-Kestner's observations; and further experiments to determine the heat of combustion of coal, or its calorific power, by taking larger quantities of the mineral and using them in the same condition as they are burnt under boilers, became very desirable. The Polytechnische Verein in Munich, therefore, established the Munich "Heizvesuchsstation," which commenced operations, under my superintendence, in the year 1879. The arrangements of the plant are shown in fig. 1. It consists of a tubular boiler with inside furnace, in which the coal is burnt as in

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* 1845. Johnson. Report of the Navy Department of the United States of America.

† 1848. De la Beche and Playfair. *Dingler's Journal*, Vol. CX., p. 212.

‡ 1849-1853. Brix. "*Untersuchungen über die Heizkraft der Brennstoffe Preussens.*" (*Berlin*, 1853.)

§ Marozeau. "*Bulletin de la Société de Mulhouse.*" *Dingler's Journal* Vol. CXVII., p. 244.

MUNICH EXPERIMENTAL STATION.

SECTION THROUGH BOILER PLANT.

A Furnace with Ten-Brink apparatus; heating surface, 53·5 sq. ft.
B Tubular boiler No. 1, with 214 sq. ft. of heating surface.
C Tubular boiler No. 2, with 139 sq. ft. of heating surface.
D_1 Condenser for boiler No. 1.
D_2 Condenser for boiler No. 2.
D_3 Liquor-pipe feeding furnace.
E Greindel's liquor-pumps.
F Liquor-tank.
G Overflow to keep pressure of liquor constant.
H Plates with orifices to keep current of water constant.
h Funnels.
I_1 I_2 I_3 Calorimeters attached to A, B, and C, containing thermometers to ascertain temperature of cooling liquor.
K_1 K_2 Plunger-pumps in connection with boilers.
L Measuring apparatus.
M M Thermometers for testing temperature of furnace gases.
N N Pipes for taking samples of escaping gases.
P Chimney-slide.
Q Thermometers.

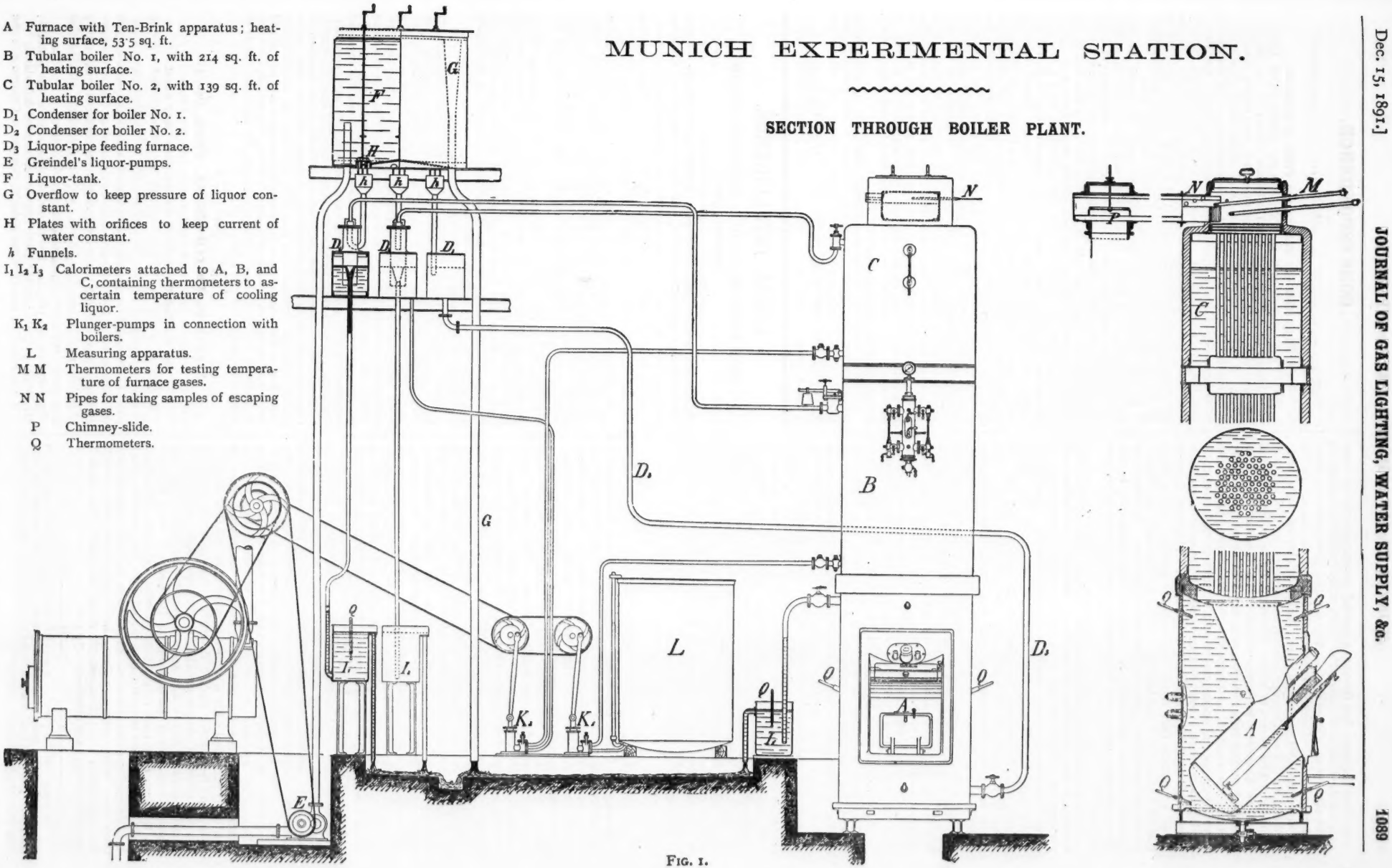

FIG. 1.

any other furnace; but there are special arrangements to measure all the heat evolved within. This plant therefore represents a calorimeter on a large scale.* For working the apparatus, from 200 to 300 kilos. of coal were burnt on the fire-bars. In the furnace, as well as about the boiler, brickwork has been avoided, as it would render difficult the measurement of the heat evolved. The latter is either taken up by a current of cold water or absorbed by evaporation. To measure the heat absorbed in the latter way, the amount of evaporated water was not ascertained, as usual, but the steam formed was condensed by a special arrangement with certain quantities of cooling liquid of constant temperature; and the increase in temperature of this liquid was carefully determined. This was done to avoid a mistake that might be made by getting wet or overheated steam out of the boilers. In the former case, the results would be found too high; in the latter, too low. To check the quantity of heat calculated by means of this condensing liquid, the condensed water was sometimes stored up, and its volume measured.

A comparatively small part—some 5 to 6 per cent.—of the heat evolved is lost, as is the case with all boilers, by radiation and conduction. This loss has been approximately determined by several trials in the same way as with calorimeters. In addition to this loss, there is to be ascertained the portion of fuel which collects unburnt beneath the grates in the ash-pit, and also the quantity of heat which is lost with the escaping gases. The latter is to be calculated from the temperature, quantity, and composition of the furnace gases. These items are added to the amount of heat absorbed by the refrigerators; and the sum will be equal to the calorific power of coal, or its heat of combustion. While the factors which form the heating power of coal may vary according to the conditions which prevail in the experiments, their sum should always be the same with the same kind of coal. Thus in the experimental station in Munich a great number of coals were tested, the results of which contradicted Scheurer-Kestner's assertions. The trials on a large scale proved that the heat of combustion of coal can be calculated by the Dulong formula to a degree of correctness quite sufficient for practical use. The variation up to 3 or 4 per cent. from the theoretically calculated calorific power, high though it may appear, is sufficiently accounted for, considering coal is not a chemically pure substance. On the other hand, the different methods vary by which the theoretical results were obtained. Moreover, while in one case several experiments were made with a quantity of something like 200 or 300 kilos. of coal in a rather complicated apparatus, in the second case about one gramme of coal was burnt in a combustion-tube, and the calorific power of this coal calculated therefrom by the aid of the Dulong formula already mentioned.

(To be continued.)

Parkinson's Patent Gas-Fires.—Early this year, Messrs. W. Parkinson and Co., of London and Birmingham, launched out into a new branch of business—the manufacture of gas-stoves. Their first productions in this class of goods were cooking-stoves; and now they have turned out a number of gas-fires, which, from what we have seen of them, we believe will commend themselves to public favour. The stoves contain some noteworthy improvements; and gold medals have recently been awarded at both Derby and Wolverhampton exhibitions. One special feature of the stoves is the patent circulating burner, which is constructed on an entirely new principle, ensuring, it is said, perfect combustion of the gas, regularity of flame, and intense heat, while avoiding hissing, roaring, and lighting back. It is also made reversible, so that a connection may be made to the gas-supply pipe at either side. The stoves, which have a well-finished and pleasing appearance, are made in various sizes. Chief among them is the "Royal," which has a curved front fire, and can be obtained either wholly in black enamel, or with side panels fitted with Burmantoft tiles and pillars in polished brass, or electro bronzed. It is constructed on the ventilating principle. Fresh air is drawn in at the lower part, and while circulating around a series of tubes, it is heated, and then escapes through perforations in the dome-shaped top, in, it is claimed, a perfectly pure condition. The flue-work is cast in one piece; so that it is impossible for the fumes to pass into the fresh-air chamber. The "Domestic" appears to be a very serviceable stove, and is specially designed for use in nurseries, bedrooms, &c. A flat top is provided with a round opening in it, so that food or water may be heated, and, if desired, a boiling-burner may be fitted to allow of simple cooking operations being performed. Smaller sizes of stoves are known as the "Brilliant" and the "Ruby;" and when these are placed on stands with art tiles on the top, they look very pretty indeed. Messrs. Parkinson and Co. have also recently introduced into the market other appliances for domestic use. In addition to their gas-cookers, they now manufacture grillers, boiling-burners, hot closets, carving-tables, hot plates, &c., from all of which, it is stated, excellent results are obtained.

* To prove that the plant is a perfect calorimeter, the following figures may be adduced: 1 kilo. of charcoal burnt yielded, on an average, 8133 calories. Favre and Silbermann found 8080 calories; Scheurer-Kestner, 8100 calories; Berthelot, 8140 calories.

CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

A Suggestion for Raising the Price of Sulphate.

SIR,—I have noticed with much surprise the apathy which appears to be shown by gas companies and sulphate makers at the very low prices at which they have for some time past been selling their sulphate. It appears to me that this state of things could be altered if some combined action were taken by the producers. The market reports always state that it is owing to the action of "bear" speculators that the prices are kept low. I should believe this was the cause if the "bears" would occasionally put the price up, as I could then see how easy it would be to make a profit by putting it down and then up again; but when it is at a constantly low figure, I am compelled to think it is a question of supply and demand which rules the price.

My view of the matter is that people who could, and would, use this manure to advantage are hardly aware of its existence; and in order to bring about a more satisfactory state of things, I would propose that a fund should be raised by each producer paying 1s. per ton on every ton of sulphate made per year. This, allowing for the production in the United Kingdom of 140,000 tons per annum, would amount to £7000. The fund should be utilized to the best advantage by a Committee elected by the subscribers; and I would suggest that one-half of the sum raised should be spent in the free distribution of literature setting forth the advantages and value of sulphate as a manure, the other half on (say) two or three lecturers who would go round to all the agricultural districts of the United Kingdom, teaching the farmers how to use it, and showing them, in pounds, shillings, and pence, the gain by so doing. These lecturers should be paid a minimum salary, and have a commission upon all sales effected by them. It appears to me that there is plenty of room at home for all the sulphate we make, if its value was really known, without having to send any of it abroad. But so long as the nitrate producers have as their agents the factors to large estates, as well as the manure people engaged in looking up orders, it is only natural that sulphate will have to take a back place, notwithstanding its admitted superiority.

I shall be glad if this letter leads to some discussion or action being taken on this very important subject, because to the gas-producing industry a rise of 20s. per ton means (say) £120,000 per annum put into their pockets—a sum not by any means to be depised.

Dec. 7, 1891. A GAS SHAREHOLDER.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Tuesday, Dec. 8.

(Before Mr. Justice KEKEWICH.)

The Staffordshire Gas and Coke Company, Limited, and the Companies Acts.

This was an application by Mr. J. F. Rushworth to have his name removed from the list of contributories of the above-named Company; it having been ordered by the Chief Clerk, on the application of the Liquidator, to be put upon the list in respect of ten shares.

Mr. WARMINGTON, Q.C., with whom was Mr. SWINFEN EADY, during the proceedings in support of the application, contended that the applicant's name was on the list for ten vendors' shares in respect of certain patents transferred to the Company by the Mercantile and Domestic Gas Company; and that his name had not been rightly put upon the list, and ought to be removed.

Mr. RENSHAW, Q.C., with whom was Mr. C. HYDE, on behalf of the Liquidator, observed that the certificate of the shares was forwarded to the applicant by the Secretary of the Company, not in respect of cash, as to which the onus of proof rested with the applicant; but "in part consideration for the use of the said licences of the Mercantile and Domestic Gas Company's patents."

Without calling upon Mr. Warmington for a reply,

Justice KEKEWICH, in giving judgment, remarked that the case was by no means free from difficulty. Having, however, carefully gone through the authorities, which he had at times found somewhat embarrassing, he had come to the conclusion that the shares in question were issued to the vendor and his nominees, one of whom was Mr. Rushworth, as fully paid up; and as he was of opinion that this came within the 25th section of the Act of Parliament bearing upon the question, the shares which Mr. Rushworth held must be regarded as fully paid. It would, in his opinion, be extremely hard upon Mr. Rushworth to hold that, because the Directors might have blundered, he should be held responsible for shares which he never intended to take, and as to which there was not the slightest evidence that he intended to accept them as other than fully paid up. It was clear that from first to last it was always intended that a proper contract should have been registered; and he therefore held that the application must be granted, and that the Liquidator must pay the applicant's costs as well as his own out of the estate.

LIVERPOOL WINTER ASSIZES.—Friday, Dec. 11.

(Before Mr. Justice COLLINS *and a Special Jury.)*

The Gas Coal Contracts of the Wallasey Local Board.

To-day an action for libel, brought by Mr. Richard Steel, a cotton broker, of Liverpool, against the Wallasey and Wirral Newspaper Company, Limited, and Mr. Jowett, the proprietors and editor respectively of the *Wallasey and Wirral Chronicle*, came on for hearing. The words complained of had reference to the settlement of the tenders for the supply of coal for the Wallasey Gas-Works; and the defendants pleaded that they were "fair comment on matters of public interest."

Mr. KENNEDY, Q.C., and Mr. PICKFORD appeared for the plaintiff; Mr. BIGHAM, Q.C., and Mr. ROSS BROWN represented defendants.

It was stated, on behalf of the plaintiff, that he is Chairman of the

Wallasey Local Board, and a member of the Gas Committee, which had to do with accepting the tenders for the supply of coal and cannel for the works. The question of tenders came before the Committee in July, with the result that it was decided to accept half of the coal (6000 tons) from the Moss Hall Colliery Company of Wigan, and the remainder from Messrs. Joseph Brewen and Co., who have offices in Wallasey. There was a proposal by some members to give the whole contract to Brewen, who supplied all the coal in previous years. Among these was a Mr. Joyce, who, like Mr. Brewen, was one of the largest shareholders in the defendants' newspaper. What the plaintiff complained of was the abuse of a series of anonymous letters which had appeared in the *Chronicle*, and in which he and ot her members of the Committee were, as was alleged, grossly libelled. The matter was first discussed in an editorial article in the issue for July 1, in which regret was expressed at the tendency of the Chairman to undue interference, and "rectitude of action" was suggested. Then followed a letter, dated Sept. 12, signed "Pro Bono Publico," in which it was stated that "the whole proceedings of certain members of the Gas Committee appear to be of so shady and one-sided a character as to suggest a doubt as to their *bona fides* also." The correspondent accused the plaintiff of "disgraceful partiality" towards the Moss Hall Company; but this, it was urged, would be shown to be unfounded, as the plaintiff had never had anything to do with that Company, and had no personal feeling in the matter. Another correspondent, who signed himself "Disgusted," said: "The charges made are grave; and, in face of the new Salford gas scandal, there appears to be ground for believing, as 'Inquirer' suggests, there is 'something rotten in the state of Denmark.'" This, the plaintiff contended, was an insinuation that the contracts were given for bribery. There were other passages in similar terms, all of which, the plaintiff said, seriously reflected on his character. He asserted that, under the plea of defending the public interests, the conductors of the newspaper in question had slandered him, with the real object of promoting the private interests of two of its principal shareholders.

After the plaintiff had been examined, the defendants tendered a full apology and withdrew all imputations. The record was accordingly withdrawn on payment of costs.

The same course was taken in two other actions brought against the defendants by Messrs. Peers and Ball, members of the Local Board.

A Correction.—In the report of the case of *Hendra v. The Chelsea Water-Works Company* in last week's JOURNAL (p. 1051), Mr. A. A. Gill's title should have been that of District Engineer; the Company's Engineer being Mr. Richard Hack, Assoc. M. Inst. C.E.

Mechanical Filters.—A correspondent, referring to the statement frequently made, that the old system of filter-beds is being discarded on the Continent and in America, where mechanical filters are being used on a large scale with good results, says he would be glad to know if these filters are in operation in this country, and where.

Extension of a Leeds Corporation Water Reservoir.—At a meeting of the Water Committee of the Leeds Corporation last Friday, it was resolved to increase the reservoir at Moortown to double its present size; and the contract of Messrs. Gould and Stevenson, of Hunslet, to do the work was accepted. The improvement will involve an expenditure of upwards of £4000.

Complaints as to the Gas Supply at Middleton.—At the last meeting of the Middleton Town Council, Mr. G. Booth, in moving the adoption of the minutes of the Gas Committee, referred to complaints which had been made as to the gas supplied in the borough. He said he thought these were caused by the defective pressure, which no doubt was largely due to the very considerable leakage existing—the average for the last five years being 10·1 per cent., whilst for the previous four years it was 13·1 per cent. If they could possibly reduce it to about 6 per cent., the saving would be from £5000 to £6000. The pressure had been reduced from 3 inches to 2·5 inches; but the Manager had found that, under this pressure, the lighting in some parts of the borough was bad, and therefore the pressure would have to be kept up to 3 inches. This reduction of pressure had had much to do with the defective lighting; for when the illuminating power of the gas produced was 18½ candles, if there was not sufficient pressure, it would appear like 17½ or 18 candles. The minutes were adopted.

The Quality of the Lambeth Water Supply.—At the meeting of the Lambeth Vestry on the 3rd inst., the Sewers and Sanitary Committee reported that, in accordance with their instructions, the Medical Officer of Health (Dr. Verdon) had obtained four samples of the water supplied to the parish by the Lambeth and Southwark and Vauxhall Water Companies, and had submitted them to the Analyst for examination. This gentleman's report stated that all the samples were London water in bad condition—a condition usually assumed when the Thames was in flood. As to the Lambeth Company's water, he explained that the samples were not the worst he had met with under similar conditions; but as to that of the Southwark and Vauxhall Company, he described it as the worst. In commenting upon the Analyst's report, the Medical Officer remarked that little doubt, if any, need be entertained of the Water Companies using the best practical means at their command for the improvement of their supply; at the same time the fact remained that the water supplied to the parish for domestic purposes was of an indifferent character, and might be the means, even when in its normal condition, of conveying disease to those who used it as a beverage. The cause of the polluted supply was the polluted source—viz., the Thames. Dr. Verdon recommended that a representation should be made to the London County Council as to the unsatisfactory state of the water supplied by the Lambeth and Southwark and Vauxhall Companies. Attention was called to the dangers of a continuance of such supply, and to the desirability at the earliest date, of obtaining a pure water for the domestic use of the inhabitants of the Metropolis, not polluted with matter from the sewage of towns or the drainage of manured agricultural lands. The Vestry adopted this recommendation, and resolved to send copies of the report to the Board of Trade, the London County Council, the Water Companies concerned, and to the Vestries and District Boards of the Metropolis.

MISCELLANEOUS NEWS.

METROPOLIS GAS SUPPLY.

The Proposed Alteration in the Standard of Light.

At the Meeting of the London County Council last Tuesday, the Parliamentary Committee presented the following report on the subject of the proposed alteration of the standard employed for testing the illuminating power of gas in the Metropolis:—

On the 28th of July last, the Council, on the recommendation of the Sanitary Committee, resolved to introduce a Bill in the next session of Parliament for substituting a more exact standard of light for that now prescribed by the principal Gas Companies' Acts, and referred it to us to take the necessary steps for this purpose. The Sanitary Committee submitted a further report on this subject on the 13th of October, referring to the endeavours made to secure the appointment of a Scientific Committee to consider what the standard of light should be; and stating that, in the absence of an authoritative decision on this point, it might be useless to promote a Bill. As the Sanitary Committee were in communication with the Board of Trade, we thought it advisable to postpone the consideration of the matter pending a reply from that department. Eventually it was intimated that steps would be taken for the appointment of a Committee; and the Sanitary Committee, at our request, furnished us with a memorandum explaining the object sought to be attained by the Bill, and also sent us the draft of a Bill on the subject. These were referred to the Agent, and, as time pressed, we instructed him to prepare and issue the necessary notice for a Private Bill, if he thought such a course desirable and practicable. The Agent is quite of opinion that the proper mode of procedure is by a Private Bill or Bills to amend the existing Acts of the Gas Companies; but he has pointed out to us that the whole procedure of Private Bill Legislation under the Standing Orders of Parliament is based on the assumption that clear notice should be given of enactments affecting particular interests, and that the Bill should clearly define the enactment required, so that the parties affected may have adequate time and opportunity for considering the case, and stating in detail in their petition to Parliament their objections and arguments against the Bill; and he does not think that any Private Bill could be properly framed dealing with this subject, unless the nature of the new tests suggested were described therein. Therefore, as it is impossible to define the standard of light until the proposed Committee has reported, the Agent thought it better not to publish any notice. We entirely approve the course which he has taken, and we recommend—"That further action in the direction of obtaining legislative authority for a more exact standard of light be deferred for the present."

On the same occasion, the Sanitary and Special Purposes Committee reported as follows:—

On the 13th of October we reported the steps we had taken with a view to obtaining a more trustworthy standard of light than the present candle standard; and also that the Board of Trade had intimated that it could not appoint a Scientific Committee to consider what the standard should be, as it had no fund out of which to defray the costs of such a Committee. We are now glad to be able to inform the Council that the South Metropolitan Gas Company has undertaken to bear the whole of the expenses of such a Committee; and that the Board of Trade has, therefore, undertaken to appoint it. The Committee is to be composed of two members nominated by the London County Council, one by the City Corporation, three by the London Gas Companies, together with the three Gas Referees, and two independent scientific men. We have selected Dr. E. Frankland, F.R.S., and Mr. Dibdin, the Council's Chemist, as the Council's nominees, and have so informed the Board of Trade. We recommend that the course taken be approved.

The consideration of these recommendations was adjourned for a week.

THE FATAL GAS EXPLOSION AT BLACKBURN.

The Coroner's Inquiry.

Last Thursday, the Coroner for Blackburn (Mr. H. J. Robinson) resumed the inquiry into the circumstances attending the deaths of Eleanor Buckley, John Casey, William Fielden, James Patterson, and Henry Smithson, who were killed by the terrible explosion of gas at the Crown Hotel in that town, on the 30th ult., as reported in the JOURNAL last week.

Mr. M. W. MATTINSON, M.P. (Recorder of Blackburn), represented the Corporation; Mr. WITHERS appeared for the police; Mr. COSTEKER, for the owner and tenant of the Crown Hotel; Mr. CROSSLEY, for Mark and Francis Robinson, who had surrendered to the police as having been responsible for the catastrophe; and Mr. RILEY for the relatives of Mrs. Buckley and Mr. Patterson.

George Ormerod, a draper and a stallkeeper in the Market Place, said his stall was formerly supplied with gas through a large meter in the cellar of the Crown Hotel. After a time he became a member of a Committee which controlled the supply to the stallkeepers, and took up the ownership of the large meter. It was his business, as a member of that Committee, to collect the accounts and turn off the gas, except on certain nights when the landlord of the hotel did it. The meter was last used on Sept. 30. Since then the tenants had been supplied from small meters of their own. About the middle of November, witness sold the meter to Mark Robinson for £1. On Nov. 15 he and Robinson went to the hotel and looked at the meter; but witness took no particular notice as to whether or not it was properly connected. Robinson asked Mr. Haughton, the landlord, about it; and he told him that two men had been down in the cellar, had finished their work, and had said, "No more gas would come through there." Witness understood they were two Corporation men; but no written notice had been given to the Corporation to undertake the disconnection. Witness, however, fully understood that the meter had been cut off from the supply-pipe.

Examined by Mr. CROSSLEY, witness said he had received no notice from the Corporation that he must not meddle with the meter. On the day of the accident, he saw the Robinsons outside the Crown Hotel, and Mark said something about the meter-taps, but witness did not remember what it was.

Examined by Mr. RILEY: He knew nothing of how the pipe and meter connections had been made, nor could he, if he saw the pipe and

meter together, say how they stood on the day of the accident. All he knew was that in some way or other a connection existed that day.

Luke Kearsley, the Foreman Inspector of the meter department of the Corporation, said that he received orders shortly after Sept. 30 to take the state of the meter at the hotel, and afterwards to caulk it. Witness was not present when the caulking was done; but afterwards he went and tried the meter with its tap, and found that no gas passed down into it. On Oct. 29 he went again, found no change on the register of the meter, and wrote the word "caulked" on it. After the accident, he found the meter index and the inlet-tap and pipe were missing.

Examined by Mr. COSTEKER, witness said that he himself had had no experience in disconnecting meters. He had no definite idea of who told him to see the meter plugged; but it was someone in authority at the works. There were three other meters besides the large one in the Crown cellar. These supplied the hotel.

Replying to Mr. MATTINSON, witness said the pipe with which the meter had been connected had been in the cellar for seven years.

Thomas Poulton, a labourer in the Gas Department of the Corporation, deposed that he and another man, named Smith, went early in October to plug the meter; and after they had finished, he examined the work, and saw that it was properly done. The meter supply-pipe was also properly connected with a boss.

Examined by Mr. COSTEKER, witness gave it as his opinion that, if the pipe had been plugged outside the cellar with a proper metal plug, the explosion could not have occurred. Shown the branch-pipe, which was about 3 feet long, and with a short bend, witness said he did not think that, after the meter had been disconnected, and the pipe thus left without support at one end, it would have been torn out at the unstopped end by its own weight. The boss at the unstopped end would have prevented that; and besides these pipes were usually screwed in fully an inch.

William Smith, the labourer who assisted Poulton, confirmed the statement of the former, that the plugging was properly done.

James Haughton, the landlord of the Crown Hotel, said that on the Wednesday before the explosion, Ormerod came to his house with Mark Robinson, and the latter asked when he could take the meter away. Witness replied that he could do so on the Monday following. Robinson came on Monday afternoon with his brother, and paid 19s. for the meter. Witness went into the cellar with them to see what tools would be necessary. They had a candle. They went away and came back again with a hammer and chisel; and they "eased some joints" near the meter with these, but did not uncouple the unions on either the inlet or the outlet of the pipe. When they had done this, witness left them and went upstairs. A few minutes after, Robinson came up and borrowed a screwkey and went back to the cellar. They shortly afterwards returned, and Robinson said, "There's a strong smell of gas somewhere," and added that he would run to the gas office. Robinson went to the office, came back, and stated that the man there had replied that it could only be air, and that he had asked him several strange questions. He had, however, telephoned to the gas-works for a man; and Robinson and his brother went outside. Witness then went into the bar to serve someone, and suddenly saw a flash of fire. He knew that after the flash he had been thrown down somewhere; but where and how he did not know, nor did he remember anything more.

Examined by Mr. MATTISON, witness said that, during the whole time he had been the landlord, there had been no escape of gas from the large meter, nor was there any, so far as he knew, before the men came to take it away.

Robert Byrom, a clerk in the Corporation Gas Department, said he remembered Mark Robinson coming to the office on the Monday of the explosion. Robinson was very much agitated, and stated that there was an escape of gas in the Crown Hotel cellar, and he wanted a man sent at once. Witness asked Robinson what right he had to meddle with the couplings, and also whether he could not plug the hole up; but Robinson was so agitated that witness at once telephoned to the gas-works for a man to be sent immediately. Witness knew of no permission having been given by the Gas Department to remove the meter—at least, he had had no notification of such.

Examined by Mr. CROSSLEY, witness said that if a person bought a meter and wished to cut it off, he would "probably" come and ask permission to do so.

At this stage, a short adjournment was made, to enable the jury to visit the wrecked premises, and examine the meter and pipes.

On the inquiry being resumed,

Samuel Athinson and *John Green* gave evidence to the effect that they were standing near the hotel when Francis Robinson came out, and told them there was an escape of gas, and they had better move away. The last-named witness thought that nearly a quarter of an hour elapsed before the explosion occurred.

Police Superintendent *Byrne* said he was on duty at the police offices on the morning following the explosion. Mark Robinson came to the offices and said, "I have come to surrender myself about the explosion at the Crown Hotel. It was caused by myself. It was a pure accident; but I want to own to it." Witness took him into custody. On the Friday morning, Francis Robinson also came, and, after surrendering, said that it was an accident, but that he also, as he was helping, was willing to answer for anything he had done. Witness added that the gas-pipe produced in Court as the one to which the meter had been connected had never been out of the custody of the police.

William Sharples, foreman in the outdoor pipe department of the Corporation, who gave instructions as to the caulking of the meter, said that this was done rather than the plugging outside, because they had had no instructions to remove the meter. Had they received proper notice of the meter being required to be taken away, a metal plug would have been put in outside; and this would have prevented the explosion. The pipe which led to the meter was a 2-inch wrought-iron one. Witness received his instructions from Kearsley; and he did not know whether or not the Corporation had received notice from the owner of the meter to cut it off.

Luke Kearsley was recalled, and said that he had received his instructions from Mr. Macminn.

This concluded the evidence called by the police.

Mark Robinson, examined by Mr. CROSSLEY, said he purchased the meter on the Wednesday before the explosion. Mr. Ormerod went and looked at it with witness; and they arranged to take it away on the following Monday. He and his brother went together; but they did not give notice to the Corporation, he having understood from Ormerod that it had been properly disconnected. They unfastened the two unions of the meter, and he at once thought he smelt gas. He went upstairs, and the landlord told him that two Corporation men had attended to the meter properly. He went down again, and his brother gave another turn to the union, when the gas came "in full force." So far as he knew, when he left it, the 2-inch pipe leading to the meter was in its proper position. Witness ran to the Corporation offices; but he was so excited that he scarcely knew what he then said. He had returned and was in the lobby of the hotel when the explosion occurred, and he was thrown into the cellar. His opinion was that the explosion took place at the back part of the building; and about 20 minutes elapsed between it and the rush of gas. He was standing on the meter holding the light for his brother to see by; his brother was using the hammer and chisel when the gas first escaped. He would not have gone near the meter or touched it at all, had he not been told that it had been disconnected by the Corporation men. He remembered when at the Corporation offices asking them to telephone for a man, and also saying, "Do you want the Crown blown up?"

Mr. MATTINSON remarked that, on behalf of the Corporation, he should not accept the explanation the witness had given. Robinson had had a criminal charge brought against him; and it would therefore be unfair to cross-examine him.

Mr. CROSSLEY said that was an improper observation. If the Corporation had any other evidence which would contradict that just given, the right course would be for them to tender it.

Witness was then asked a number of questions by the jury as to whether, while at work on the meter, he had not shifted the supply-pipe; but he persisted that "to his knowledge he had not done so."

Francis Robinson said that neither he nor his brother touched the pipe; but he himself had unscrewed the unions. When he had undone the top one, the gas came all at once, and he cried out, "Put the light out." The gas came at the side of his face; but he could not say exactly where it came from. His brother had jumped on to the meter to hold the light just before the escape of gas came. It was possible that in doing so his brother might have shifted the pipe, as he took hold of it to assist him in jumping on to the meter.

The CORONER then summed up. He said there was no doubt that the Corporation had not been given any written notice to remove the meter. Under the Corporation bye-laws, it was an illegal act, he considered, to remove the meter without such notice. As to the two men who engaged in that work, he thought that a person who caused death by doing a lawful act in an improper manner was guilty of manslaughter equally with a person who did an unlawful act in an improper manner. It was for the jury, however, to determine whether the evidence went to this length, or whether the explosion occurred in a purely accidental manner.

After about 25 minutes' deliberation, the jury returned a verdict of "Accidental death," and the foreman added that they desired to express their sympathy with the relatives of the deceased persons.

Committal of the Robinsons for Trial.

At the Blackburn Borough Police Court on the following day, Mark Robinson and his brother were charged on remand with causing the deaths of the five persons referred to in the proceedings above reported. Superintendent Byrne said he charged both prisoners that morning with causing the death of Eleanor Buckley by unlawfully disconnecting the gas-meter in the cellar of the Crown Hotel, in Victoria Street, on Monday, Nov. 30, thereby bringing about an explosion by which the woman was killed. John Sudell, a plumber, said he had had 30 years' experience in laying gas-pipes and communications with meters. He had seen the meter in the hotel and the pipe produced; and his opinion was that it had been knocked out of the socket of the service-pipe by accident. He came to this conclusion because the threads were daubed for a certain length with white lead; and, to all appearance, the pipe had only been held by about two threads. He did not think the pipe had been unscrewed. The presiding Magistrate said the Bench were of opinion that the case ought to go to a jury; and the prisoners were therefore committed for trial at the next Manchester Assizes.

NOTTINGHAM CORPORATION GAS SUPPLY.

Improvements at the Eastcroft Works.

At the Monthly Meeting of the Nottingham Town Council on Monday last week—the MAYOR (Mr. R. Fitzhugh) presiding—the report on the proposed renewals at the Eastcroft gas-works, which was summarized in the JOURNAL for the 1st inst., was presented.

Alderman BARBER, in moving the adoption of the report, said it did not at all, in the ordinary sense of the word, deal with an extension of the works, but simply with a renewal of such parts as had become worn out and obsolete. Of course, in carrying out the renewals, the capacity of the works would be immensely increased; and in this sense it was an extension of their works. The retort-house and the engine power at Eastcroft had been in use for about 40 years. As the members were aware, during that period very great improvements had been made in the method of purifying gas, and the system generally of constructing gas-works. The present means of purification would not be sufficient even if there had been no increase in the quantity of gas made, because the apparatus was entirely obsolete and worn out. Since Mr. Chester had been the Engineer, the mode of carbonizing at Eastcroft had been materially altered by him; and they would no doubt be astonished when they heard that the production at the works had been increased by no less than 78 per cent., by the adoption of the regenerative system of carbonizing. This increased quantity of gas must be purified; and according to the present system of doing it, they were compelled to send out the gas from Eastcroft in a condition that was neither satisfactory to the Committee nor to the consumer. Not only was this so, but the cost of purifying the gas under the existing

method was very large. At the Basford works, for instance, where an improved system of purification had been adopted, it cost them 4¾d. per ton of coal carbonized; whereas at Eastcroft it cost 7d. per ton. This on 50,000 tons of coal made a difference of £480; so that the members would see that very great economy had resulted from altering the purifying works at Basford, and placing them on the most modern basis. Besides, the pressure at which the gas had to be sent through the purifiers at Eastcroft was attended by imminent danger. It would be a most hazardous thing for any person to go through the purifier-houses with a naked light. There was a liability that the purifiers would blow; and there might at any time, therefore, be a very serious accident arising from the escape. With respect to storeage accommodation, it was very bad economy to have less than 24 hours' storeage in any works. At the present time they had storeage for about one-third of that time; so that the gas in this respect had to be sent out in an improper condition, and any hindrance or slight accident which might occur in connection with the works would be attended by very serious consequences. The Committee proposed, as would be seen by the report which had been presented, to enlarge the present gasholders, and so to obtain a large amount of storeage room. The cost of rebuilding the purifying-house, supplying fresh engine power, and enlarging the gasholders, would amount to about £35,000. Fortunately, the Gas Committee had accumulated a fund for the purpose of meeting their occasional large outlays. It had been the uniform practice of the Gas Committee never to allow depreciation. Their works were every year kept up to the full, as far as it was possible to do so; but there were certain things which could not be mended or repaired. The works must go on until particular parts became worn out; and then, when they required it, they could be entirely renewed. This applied to the gasholders, and more especially to the purifier-houses and to the engines. So far as was possible, they had been repaired when necessary; but now the time had come when they must be entirely renewed. At such a period, they recognized the value of the reserve fund which they had accumulated year by year out of revenue to meet large outlays, or to provide against unforeseen accidents. The cost of the work, as to which he thought the report was very explicit, would, therefore, be met without any increase of capital whatever. It would be a very good thing if they could do all the work at once; but, in consequence of the necessity of continuing to make a certain portion of gas at Eastcroft, it would have to be done in detail, so as to hinder the production as little as possible.

Alderman FORD seconded the motion.

Mr. J. T. M'CRAITH observed that he was a little amused to hear Alderman Barber say that the reserve fund was instituted for defraying occasional large outlays, because in the report, which was signed by him as Chairman of the Committee, the object with which the fund was started was properly set forth—that was, it was a sum set aside for the purpose of providing against extraordinary outlay. He (Mr. M'Craith) was not going to say that the money should not be taken out of the reserve fund, because, perhaps, under the unfortunate circumstances in which the town was at present placed, it might be desirable to do so. He thought it should be understood, however, that, in acting in this way, they were not dealing with the fund with what might be called sound financial consideration. One of their Auditors (Mr. Gath) said in his report: "The system of keeping the £100,000 intact, and using the interest arising from its investment for the purpose of purchasing annuities, as opportunity and market price permit, and until the annuities and reserve fund are of equal amount, is sound financing, and such as must commend itself to the judgment of ratepayers." He was sure that, under certain circumstances, Alderman Barber would have been the very first to oppose this fund being touched. If they trenched upon the fund for the purpose of this work, they might just as well take it when they were considering the question of the district rate. Alderman Barber had told them that the work was chiefly in the nature of renewals. But he had also said that, to some extent, it consisted of extensions; and the cost of these ought certainly to come out of capital. Doubtless Alderman Barber would be able to recall other occasions when gasholders in the town were enlarged, and when there was an addition made to capital; the reserve fund being left intact. What surprised him (Mr. M'Craith) was that in a Corporation such as their own, where they had been led to believe that the gas-works were simply perfect, they were face to face with a condition of things which formed the strongest indictment against the works which it was possible to conceive. Speaking of the purifying apparatus, the Engineer stated in his report: "Besides being inadequate for the work, and in some respects a source of danger, it is almost completely worn out." This was a sample of that which ran through the whole document. It occurred to him that there had never been a report presented to the Council which would cause greater surprise than that which had been submitted by the Gas Committee. He believed Alderman Barber said that the bad state of some of the plant might result in the production of inferior gas. It was very well known that, if anyone had suggested that the gas was bad, Alderman Barber would have been the first to object. He would have told them that it was not the gas, but the burners which were bad. He hoped that Alderman Barber—whom they all knew to be a most able Chairman of the Committee—would keep a little more watchful eye over the plant at the various stations. They read in a report which was presented in March, 1890, that the works were in good condition, and that the efficiency of the manufacturing plant had been maintained. Eighteen months later they had placed before them a report upon which the present expenditure was asked for. He thought it was a matter which, in future, the Committee should take under their serious consideration. Having regard to the estimated cost of the proposed renewals, it seemed to him that during the last ten years they had been over-estimating the profits of the gas undertaking by something like £2200 annually, because the whole of the renewals should have been paid for out of revenue. The plant should be kept in a perfect state of repair, and the cost of renewals defrayed out of the profits. He trusted that a long time would elapse before they had again such an unfortunate report before them as was presented for their consideration that morning.

Alderman Sir JOHN TURNEY said he fully agreed with the report; and he thought that the expenditure of the money was right and just. The plant they were going to deal with had been in use a number of years; and he considered the Committee had done wisely in using it as long as they could, and then, when they were reconstructing it, to enlarge it to meet the future requirements of the town. Whether they took the money out of the reserve fund or current income was quite immaterial. He supposed that when the reserve fund was reduced to £65,000, the Gas Committee would cease to hand over so much money to them in reduction of the district rate until the fund was raised to £100,000 again.

Alderman BARBER, in reply, said he did not wish that there should be any mistake about the reserve fund. The Council had never instructed the Gas Committee to accumulate such a fund. It had been purely the action of the Committee to accumulate the fund year by year, in order that when any large outlay, such as was now contemplated, was necessary, they would not have to borrow money or go to the ratepayers for it. All the renewals had been met year by year out of revenue; and the gas consumer had therefore paid for them, and not the ratepayer. The reserve fund had also been accumulated out of revenue provided by the gas consumer and out of profits; and it was alone for the purpose of being prepared for any large outlay or any loss through any serious explosion that the fund was formed. They had done that without pressing upon the ratepayers or the gas consumers in any particular year. The district rate would be little impaired. They could not take the money out of capital, because the plant was put down with borrowed money, which had been paid off. Therefore, the renewals must be paid for out of the revenue of the year or the accumulated revenue; and it was the latter which they were now asking to spend. Mr. M'Craith spoke about sound financing; but he (Alderman Barber) did not know anything that would be worse financing than to expend those large amounts of money without having reserve funds to fall back upon.

The motion was then carried unanimously.

LOCAL AUTHORITIES AND ELECTRIC LIGHTING.

A report on the subject of electric lighting will shortly be submitted by the Electric Lighting Committee to the Middlesbrough Town Council, and it contains some interesting information which has been collected from various sources. In all they applied to 97 local authorities for a brief outline of their experiences of electric lighting. Of the total number, only 27 were similarly situated to Middlesbrough, where the gas-works are the property of the Corporation; and it is noticeable that the great majority of these have either taken no steps whatever in the direction of adopting electricity, or have been content to keep private firms out of the field by obtaining a Provisional Order of which they have not availed themselves. In those towns where electric lighting has been introduced, the comparison of the cost with that of gas was not encouraging. Chelmsford was the only place from which a satisfactory report was received; the authorities there stating that the *estimate* for electric lighting was less than that for gas. At Hastings, the cost was double; at Liverpool, with gas at 3s. per 1000 cubic feet, it was four times the cost; and at Stafford, the cost was from two to three times that of gas. The report from Barnet stated that the Local Board "entered into a contract for the lighting of the district for three years; and on the expiration of this term, they reverted to gas, but as legal proceedings were pending, no further information could be given." At Hornsey, "the Board has successfully opposed on two occasions the introduction of electricity for lighting purposes, as they consider that the time has not yet arrived when such works could be undertaken with advantage to the ratepayers;" and Lincoln has replied to several electric lighting companies who have approached them that, "if electricity must come, we will supply it ourselves." This report will be placed before a special meeting of the Middlesbrough Council next month, when (remarks a local paper) perhaps the best interests of the town may be served by taking to heart the bitter experience of Barnet and the wisdom of Hornsey and Lincoln.

AN ELECTRIC LIGHTING INSTALLATION FOR NOTTINGHAM.

A report of the Electric Lighting Committee, in which they asked permission to expend a sum not exceeding £25,000 or £30,000 on an installation of the electric light, provoked a brisk discussion at the meeting of the Nottingham Town Council yesterday week. The adoption of the report was moved by Alderman Sir John Turney, who stated that it was nearly four years since the Committee was formed. During that time, they had taken the advice of several experts; but the advice was of a conflicting nature—in fact, the experts were all at variance. However, the people of the borough having decided that it was time electric lighting was commenced, the Committee thought it wise and prudent to make a start on moderate lines; and they asked the permission of the Council to light up a section of the town at a cost probably not exceeding £25,000 or £30,000. They proposed to obtain specifications, giving all necessary details as to what would be required, and to bring these before the Council for confirmation or otherwise. In seconding the motion, Alderman Sands mentioned that the Committee were in favour of small installations worked at low pressure in different parts of the town; and the scheme they proposed would be upon these lines. In reply to Mr. Lucas, the Town Clerk stated that a report was presented by the Committee on May 4 last, in which the result of tenders for lighting by electricity was given; but they recommended that none of them should be accepted. Mr. Lucas then proceeded to remark that this was a question which needed the most careful consideration of the Council. They were asked to commit themselves to the principle that the town should be lighted by electricity by the Council. This meant, to his mind, not an expenditure of £30,000, but most likely of £100,000; and before they embarked the money of the ratepayers in a hazardous enterprise, they should find out whether it was possible to induce private individuals to introduce the light. The

tenders which had been received should be open to every member of the Council; and the matter should be deferred until they had an opportunity of seeing them. He knew what one tender was; and it was most satisfactory—the promoters offering to share any profits after paying 7 per cent. He proposed that this matter be adjourned until the next monthly meeting, and that the tenders be open to the inspection of the Council. The amendment having been seconded by Mr. Elborne, Mr. Pyatt urged that electric lighting ought at once to be taken up with spirit by the Corporation. Mr. Hardy said he did not know who the private company alluded to by Mr. Lucas might be; but he had no doubt the Directors were very keen, shrewd business men, and that they wanted to supply an article of probable utility at a profit. Would it be reasonable, he asked, for the Council as representing the ratepayers, to stand by and allow strangers to come and take the profits, and then afterwards feel under the necessity of purchasing their works from them in the interest of the public? Mr. Bentley contended that it would be better for the Council to retain the entire control of the streets. Mr. Brownsword having pointed out that they had a great amount of water power at command, which he should be glad to see utilized for the purpose of generating electricity, Sir J. Turney replied upon the discussion, saying, with regard to Mr. Lucas's remarks, that he was not in the habit of asking the Council for £25,000 or £30,000 with the intention that, when he obtained it, there would be involved an expenditure of £100,000. But if the Council thought well to spend another £25,000 or even £100,000, it would not be the fault of the Committee. As to the tenders which had been sent in, if it had been the duty of the Committee to bring them before the Council, they would have done so. The amendment was negatived; and the report was adopted with only two dissentients.

GAS AND ELECTRIC LIGHTING AT TAUNTON.

Proposed Purchase of the Gas and Electric Lighting Works by the Corporation.

At the Meeting of the Taunton Town Council last Tuesday—the Mayor (Mr. Alderman W. M. Chapman) in the chair—the Watch, Lighting, and General Purposes Committee presented a report in which they expressed the opinion that it would be "advisable that negotiations should be entered into with the Gas and Electric Lighting Companies for the acquisition of their respective undertakings." Alderman Van Trump, in moving the adoption of the report, said that if the sums required by the two Companies for their properties were anything like favourable—and he did not think they would be outrageous—there might be a considerable saving to the town from the acquisition of the gas and electric light undertakings. The Gas Company's property would be a valuable asset; and the Electric Light Company's premises would not be a drag on them. If the Council would endorse the proposal of the Committee, steps might be taken to ascertain the price of the respective concerns. Passing on to refer to a recommendation in the report that several new gas-lamps should be put up in places specified, he remarked that one or two of the streets in the Rowbarton district had no gas-mains laid in them at the present time, and therefore the Sub-Committee had had to recommend that oil-lamps should be used for the present. Mr. Goldsmith seconded the motion. Referring to the latter subject alluded to by the previous speaker, he said that during the last four or five years many new streets had been made and houses erected; and the residents in some of them had presented memorials asking that the streets should be lighted. The Committee had called upon the Gas Company on several occasions to put down mains, so as to provide the light. The Company up to the present were not, however, in a position to accede to the request. The people residing in the houses to which he had referred were entitled to protection, as far as it could be afforded; and yet the Council were only able to give them flickering oil-lamps, the light of a hundred years ago. This light was not sufficient. The Committee had received several complaints. If the Company could not, or would not, do what was needed, it was time for the Council to say they would do it themselves. Alderman Van Trump pointed out, with reference to the laying of mains by the Company, that years ago an arrangement was come to with them by the Local Board of Health to pay a proportion of the cost. The Lighting Committee, however, taking into account the many new streets which had been built, considered that to continue this arrangement would entail a very heavy expenditure, to which they were not justified in going. The Company did not feel inclined to lay mains unless they expected to receive a sufficient number of customers; and therefore they were only acting on business principles. Alderman Saunders said that in the case of one of the new streets recently built, the Company had received an application to put up one lamp. They had to deal with these matters from a business point of view; and was it reasonable to expect them to lay a main 200 or 300 yards long for the sake of one lamp, and without even a guarantee that the lamp would not be taken away? They were most anxious to do all they could to meet requirements, and especially when they were those of a public body. Mr. Adams did not think so important a matter as the one under discussion should be decided that morning. He did not think it desirable to proceed in the matter of purchase, and did not believe the town would at present be prepared to take over either of the concerns. Alderman Van Trump pointed out that the report of the Committee, if adopted, did not bind the Council to anything. The information obtained would, however, be useful another time, if it was not wanted now. Mr. Wrenn moved that a Committee, consisting of the Chairmen of the various Committees, who were not shareholders of either of the Companies concerned, should be appointed, to open communication on the subject of purchase. Alderman Saunders said he thought the proposal brought forward by Alderman Van Trump would be a great surprise to the Directors of the Gas Company. The proposition of Mr. Wrenn was not seconded; and an amendment to postpone the matter for a month was lost. The Committee's report was thereupon adopted.

GRAND JUNCTION WATER-WORKS COMPANY.

The Half-Yearly General Assembly of this Company was held at the Office, No. 65, South Molton Street, W., on Wednesday last—under the presidency of Mr. C. J. B. Hertslet.

The Secretary (Mr. J. W. Fisher) having read the notice convening the meeting, the report and accounts were taken as read.

The Chairman expressed the hope that they would agree with him that the report was on the whole satisfactory, and that the accounts showed the Company to be in a healthy condition. There were two large items in the accounts on which, no doubt, they would require some explanation. The first was the increase in their rating of £1265, which had been caused by the recent quinquennial assessment. The other item was £2644 for parliamentary costs, which were incurred in consequence of what took place before the Committee of the House of Commons last session. Had it not been for these costs, they would have been in a position to have paid ½ per cent. per annum more dividend upon their ordinary share capital; but he did not mean to say that it would have been desirable to have done so. The third clause of their report related to the several Bills affecting the Metropolitan Water Companies which were brought before the House of Commons last session. All of these Bills that were read a second time were referred to a Special Committee of the House, which reported that the preambles were not proved, and that "if the London County Council was to be the Water Authority, they should purchase the Water Companies' undertakings by agreement or by arbitration, and if the undertakings were not purchased, there should be a parliamentary inquiry into the statutory powers and obligations of the Companies." No charge was at that time made against the Companies. It was not alleged that the water supply was of bad quality or insufficient in quantity. The Chairman of the Committee said that time would not allow them—they sat for 21 days—to hear evidence on behalf of the Companies; but he stated that the Companies would in no way be prejudiced by evidence not having been produced on their behalf. He particularly desired to point out that no charge was made at that time against the Water Companies; but since then the Engineer of the London County Council had made a bitter attack upon them. He had said that the water supplied was impure and unwholesome; and a variety of charges of that sort had been made, which he (the speaker) was certain could not be substantiated. He thought he might call their attention to what had occurred of late years in connection with the Metropolitan Water Companies. He would go back as far as the Royal Commission of 1869, which was presided over by the Duke of Richmond. That Committee said: "We are of opinion that there is no evidence to lead us to believe that the water now supplied by the Companies is not generally good and wholesome." Then, Dr. Frankland, the Government Analyst, in his report for last year, speaking of the organic matter in the London water supply, as derived from the Thames and the Lea during the years 1868 to 1890, both inclusive, said that "the maximum amount of organic contamination was never lower than during the past year, and only in 1884 was it so low." They had also the last report of the Local Government Board for 1890-91, in which the Government Water Examiner and the Government Analyst both expressed satisfaction at what had been done by the Water Companies. Dr. Tidy's report for November last (which was dated the 27th inst.) said: "The sample from the works was received at the London Hospital Laboratory on the 12th ult.; and was found to be clear, bright, and well-filtered. The samples from the Company's mains were taken by myself at Uxbridge Road on the 6th, 14th, and 23rd. Of the 25 samples collected from the mains of the Company during the month, the whole were found to be clear, bright, and well-filtered." Dr. Tidy was their own Analyst—he was retained for the Companies; but the other gentlemen—the Water Examiner and Dr. Frankland, the Analyst—were both retained by the Government, and it was their duty to see that the water supply was of a pure and wholesome nature. He thought, after this, he was justified in stating that the water supplied by the Companies generally had been of ample abundance and good quality; and that therefore the Companies had nothing to fear from investigation. They had all supplied good water in abundance; they were doing so now; and they were prepared to do so in the future. There had never been any complaint of deficiency of supply; and there was nothing to lead to a suspicion that there would be any lack of water in the future. The Water Companies had had to bear enormous expense on account of this investigation, from which they had derived no immediate benefit, though he thought they might do so in the future. In the face of the report of the Special Committee referred to, which was to the effect that if the Companies' undertakings were not purchased, a parliamentary inquiry should be held into their statutory powers and obligations—notices had been given for further Bills next session. What these Bills would be they did not, of course, know. They seemed, however, to be very much on the lines of the last; and it appeared to him difficult to understand how the House of Commons could read a second time a Bill which appeared to be directly in the teeth of the report of their own Committee. They would see from the report that further works were being undertaken. They had erected new engines at Hampton; and the new filter beds were being rapidly proceeded with. The Directors were down there about a fortnight ago; and they were perfectly satisfied with the way in which the works were being executed. They recommended a dividend at the rate of 8 per cent. per annum on the ordinary share capital, 7½ per cent. per annum on the £25 "C" shares, and 7 per cent. per annum on the new ordinary £50 shares. He concluded by moving the adoption of the report and accounts.

Mr. F. Tendron seconded the motion. He said he thought that the remarks addressed to the shareholders were admirable. They had gone into the very important subject of the inquiry before the Special Committee of the House of Commons; and that would tend to put the Companies in a very different position to that in which they would have been placed if Mr. Binnie's report had been allowed to circulate without being replied to. It had been fully intended that the whole of the questions brought forward by that gentleman should have

come before the Committee; and they had ample evidence to prove their incorrectness, and that the Companies had been fully doing their duty to the public. He knew for an absolute fact that during the short time he had been a Director of the Company they had spent about £200,000 in various ways on the improvement, increase, and security of the supply. With respect to one important matter brought forward by Mr. Binnie and others, it would appear that they desired as a Company—and the remark applied to the Water Companies generally—to sell their property. They, however, had no desire to be purchased by the London County Council, or to be taken over in any way. On the contrary, they wished to go on in the future as in the past—doing their best for their proprietors and for the public. If, however, there was a strong desire on the part of the consumers that they would rather have the whole of the water supply consolidated in their own hands, the Companies said that they were willing either to make an effort themselves to consolidate the concerns and have one large Company, or to allow the Companies to pass into the hands of a Trust. What they maintained was that, if it were desired that they should be taken over, they ought to be dealt with in a liberal and considerate spirit; and that the very least that could be given to them was, not only what they were actually earning now, but something for those prospective advantages to which they had looked forward, from the money they had expended. A great deal of this expenditure was not productive, but it had been incurred in order to ensure the regularity and the efficiency of the supply; and a great deal of it, he might add, was for the supply of districts outside London. Very few realized what a small proportion of the Water Companies' districts was in London, the remainder being outside. If the London County Council had approached the Water Companies on proper lines, and had not tried to depreciate their properties so as to get them cheaper, there would have been comparatively little difficulty either in consolidating the Water Companies—a proceeding advantageous to the public without being injurious to the shareholders—or in transferring them to a public authority. This was a very serious question, and affected property not only in London, but throughout the country. If they once got into the idea of the masses that for the public convenience an agitation which would depreciate the Water Companies' property was justifiable, in order that it might be got into public hands cheaply, and then that the supply might be given at rates that would hardly pay, but which would be beneficial to the mass of consumers, then no property would be safe. If ever there was a property that might be considered secure, he thought it was that which was invested in a neoessity of life. In view of the attack made on the London Water Companies, the railway, tramway, dock, and gas companies ought to band together, and see that men who would protect their interests were returned to the County Council or at the General Election that must soon take place.

Mr. M'LEAN thought the Directors had acted very wisely in bringing before the proprietors what they had just heard. They all agreed with the proposal that the public of London ought to have the best practicable water supply; but the contention of the Companies was that the public had this supply already.

Dr. LEESON said they all felt that the Directors had had an anxious time in the past six months. The expenditure on parliamentary costs was very heavy; but the Companies must defend themselves, and he was sure the proprietors regarded the outlay in question as judicious. In view of the fact that London was the healthiest city in the world, he could see no reason why there should be any complaint as to the quality of the water supply. They regretted the loss of 1 per cent. in the dividend; but they were thankful to receive 8 per cent., and must hope the dividend would rise shortly to its former rate.

Mr. I. A. CROOKENDEN believed that the proprietors generally felt greatly indebted to the Directors for the masterly way in which they had met the present situation; and he thought, after what they had heard, that the position of the Water Companies—that of the Grand Junction Company, at any rate—had been carefully preserved. He was reminded, in connection with the attitude taken up against the Water Companies, of what the late Mr. John Bright said on one occasion, with regard to the Gas Companies: "It is incessant agitation without any practical object in view." He did not know whether any steps could be conceived by which it could be pointed out to the Government that these incessant and repeated attacks were unjustifiable, in view of the fact, as mentioned by the Chairman, that no accusation against them could be sustained. Great misconceptions arose after an inquiry of the kind in question. The late Mr. Haggis used to take a very active part in the London County Council; and in his memorandum he stated, among other things, that it was clear, from the recent inquiry before the Parliamentary Committee, that more water could not taken from the Thames; and immediately afterwards he based on this assertion the theory that some day the County Council or the Companies would have to go elsewhere for the supply. The fact, however, was that the Committee admitted, when the matter was pressed by a member of the London County Council, that such a theory could not be imported into their report; and they declined to say that no more water could at any rate be taken from the River Thames. The Companies were prepared to prove that a great deal more water could be taken from that source, and that without any injury being done to the river. He maintained that the people were being falsely educated and misled by these misstatements, and he hoped that the Directors would see their way to arrest this as far as possible. With regard to the dividend, he thought another fact might be deduced from it—namely, that the Water Companies were not the grabbers of dividends or profits that had been suggested. They, in fact, from their earliest days, had first of all studied to give the people of London the best supply of water that could be obtained; and many Companies were now spending thousands of pounds with the view of finding water, to meet future requirements, without the question of dividend arising at all.

Mr. WILLOUGHBY said he thought he might mention one fact as showing the impartiality of the London County Council—that they had published and sent to every Local Board the speech of Sir Thomas Farrer, the memorandum of the late Mr. Haggis, and the report of Mr. Binnie; but they had not circulated what Mr. Beachcroft had said on the other side. The increase of the Company's rating by the last assessment was £1265 for the half year, while the increase on their rental was only £1365. What had become of the increased rents due to the Company on account of the quinquennial assessment?

Mr. SPICER inquired whether the Company had fought on appeal against the increased rating.

Mr. TENDRON stated that the question asked by Mr. Willoughby, was a puzzle to everyone. Their rents had only increased a few hundreds more than they had been increased in their rating. This showed that the Water Companies had not gained enormously by the quinquennial assessment, as everyone had been led to suppose; and if they were of a suspicious nature, and were willing to make attacks on people broadcast, they would say that those who made the assessments took care to assess public companies heavily, while not assessing houses in the same proportion.

The CHAIRMAN stated, in further reply, that they had not made any appeal in connection with the assessments. With the assistance of Mr. Fisher, everything had been done amicably, by application to the authorities. This was much more satisfactory than going to appeal; and very considerable reductions had thus been made.

The motion was then put and carried unanimously; and the payment of the dividends recommended was agreed to.

Votes of thanks to the Chairman and Directors and to the Engineer, the Secretary, and other officers, terminated the proceedings.

THE BIRMINGHAM WATER SCHEME.

Meeting of Ratepayers.

Last Saturday week, a Public Meeting of Ratepayers was held at Birmingham for the purpose of authorizing the City Council to make application to Parliament in the ensuing session for an Act empowering them to carry out the scheme for obtaining a supply of water from the Rivers Elan and Claerwen and for other purposes. The MAYOR (Mr. Lawley Parker) presided; and, in addition to the members of the Council, there were only about 200 ratepayers present.

The MAYOR having explained the object of the meeting,

Sir T. MARTINEAU moved the necessary resolution; and then proceeded to describe, at some length, the scheme contemplated by it. To show that a fresh supply of water was required without delay, Sir Thomas pointed out that the consumption had increased about 100 per cent. since the Corporation took over the undertaking in 1876. In that year the consumption was 3031 million gallons, or an average daily supply of 8·30 millions; while during the twelve months ending March last, it was 6141 million gallons, or a daily average of 16·82 millions. Their Water Engineer (Mr. Gray) estimated that in 1900 they would need an average supply of 21 millions per day; and it would be 1900 before they could complete the works which were proposed to be first carried out. He (the speaker) was quite prepared to defend the scheme as the best possible that could be found. The statement had been made that they might develop their local resources at a moderate expense. He admitted that the immediate difficulty could be met in this way; but he pointed out that they would in the first place be running a very great risk of losing the rare opportunity now offered, and they would be taking a course which would be less economical than that now before them. The most scientific men they could consult were most distinct and strong in their opinion that there was no district so good for the supply as the upper waters of the Elan and Claerwen; and the water would be pure and plentiful. Coming to the financial part of the scheme, Sir Thomas said that they proposed to take powers which would practically enable them to go on for 50 years. The Engineer (Mr. J. Mansergh) proposed that there should be a first instalment of the works, including two pipe-lines, which, he computed, would cost £3,340,700. About 1904, they ought to put down another pipe-line at an estimated expense of £700,000; but the third instalment need not be commenced until 1915. The ultimate cost of the scheme would amount to £5,654,953. Looking ahead for half a century, they must add to the estimate £761,250, which made a total of £6,416,203. The Water Committee proposed to ask for borrowing powers to the extent of £6,600,000, in order to cover the cost of land, which he was sure it would be wise to buy rather than allow it to fall into the hands of people who might cause it to be polluted. How was the annual charge on this sum to be met? There was a continued steady increase in the annual water-rental; and this gave them every year a sum of money considerably in excess of the previous year. This was one of the factors which would go to make up the sum which would be required to meet the annual outlay. Then, as soon as the water began to flow by gravitation into the city, they would save £20,000 a year on the pumping. Lastly, they would make some addition to the water-rentals now paid by the consumers. This was the only addition which would fall on the water consumers; and they did not propose to make any demand upon the ratepayers. The increase to the water consumers would not be on any enlarged maximum rate; it would simply be within the lines of the maximum rates authorized by the existing Acts of Parliament, and the amount of re-imposition would amount to less than the remissions they had made since the undertaking was acquired.

Mr. FALLOWS (a member of the Council) seconded the resolution; saying that one of the most important objects the governing body of any municipality should seek to carry out, was the provision of a continuous, pure, abundant supply of water. He hoped the ratepayers would confirm the resolution unanimously. If the scheme were rejected, the supply would be absorbed by other people. London was already looking after it; and if Birmingham lost the present opportunity of acquiring it, it would be lost to them for ever.

Mr. WHITFIELD asked what would be the cost of buying the riparian rights and those of the authorities who had the right to the freehold of the watershed.

Mr. BAKER disputed the estimated rate of increase in the water-rental, and read a number of figures in support of his contention.

Mr. KNIBB called attention to the beggarly array of empty benches, and pointed out that the present meeting could not be regarded as a "town's meeting." He should move that the meeting stand adjourned until it had been properly advertised.

The MAYOR said he could not accept any amendment; and, with regard to the calling of the meeting, it had been duly advertised in accordance with the Act of Parliament.

Mr. HEATH said he had had a great deal of experience with respect to water supplies. He gave the Water Committee credit for doing the best they could; but he very much doubted whether the water from Wales, if brought through pipes and exposed to the light and heat of the sun in reservoirs, would be of the desirable quality that they anticipated. It would require to be kept covered in smooth-bottom reservoirs; and he thought the risks of bringing the water so great a distance had not been fully considered.

Mr. BERIAH SHEPHERD said he did not dispute the necessity for a better water supply; but at the same time he did not think they wanted so large a supply of pure water. At present there was a great deal of waste; and measures should be taken to economize the pure water from the present sources.

Mr. GOODWIN wished to bring before the notice of the meeting the fact that, while the new supply would supersede the old, yet the latter would still stand for the same amount as at present in the capital account of the Water Department, and interest would have to be provided upon it. The ratepayers would have been glad to know that some other scheme had also been discussed by the Council. He did not wish to condemn the action of that body; but he thought a longer period for consideration by the town would have been desirable.

Sir T. MARTINEAU, in reply, said that he was surprised that Mr. Whitfield, who was an estate agent, should ask for details of the prices the Committee were going to pay for the land they proposed to buy. They had arranged for a margin of about £160,000 or £170,000, in order to enable them to acquire the land upon the watershed, to avoid the chance of pollution; but he declined to go into the question of the price they were going to pay the vendors. Mr. Heap and others had asked for further time for consideration of the question; but they would every year ask for further consideration. They ran the imminent risk of a water famine; and as there had been ample opportunity of discussing the subject, he thought no further time was required. Mr. Shepherd had said there was a great deal of water wasted. That was true; but the Committee tried to diminish it as much as possible, and they would continue to take steps to prevent it.

The resolution was then put and carried, amid loud applause, with only about a score of dissentients.

Mr. B. SHEPHERD: Have I power to demand a poll? (Loud cries of "Shame," and hisses.)

A VOICE: It will cost £2000.

Mr. SHEPHERD: I will take the consequences.

Mr. WHITFIELD: I second it.

Mr. C. E. MATHEWS asked if Mr. Shepherd understood what he was asking for. The ratepayers were not asked to pass the scheme of the Committee, but to give the Committee power to go to Parliament to get the Bill sanctioned. Every detail of the scheme—the interests of the inhabitants, the water consumers, and the ratepayers—would be considered by Parliament.

Mr. SHEPHERD: I demand a poll.

The MAYOR observed that this was greatly to be regretted. The poll would be taken on Monday, Tuesday, and Wednesday; and the meeting would have to be adjourned.

At the Adjourned Meeting, which was held on Thursday,

The MAYOR said that his duty was a very simple one—merely to declare the result of the poll which had been demanded at the meeting on Saturday. The votes for the resolution authorizing the Council to make an application to Parliament in the ensuing session for an Act empowering them to obtain a supply of water from the Rivers Elan and Claerwen numbered 7837, and against 997, which gave a majority for the resolution of 6840. He had also to announce that the number of ratepayers who voted for the resolution was 4016, and against 563; the majority of voters in favour being 3453. He therefore declared the resolution carried, and the meeting dissolved.

THE PROPOSED PURCHASE OF THE IPSWICH WATER-WORKS BY THE CORPORATION.

At a Special Meeting of the Ipswich Town Council last Wednesday—the MAYOR (Mr. D. Ford Goddard) presiding—a report was submitted by the Water Committee on the subject of the acquisition of the water-works.

The Committee stated that, after receiving the instructions of the Council to inquire into this matter, they called to their aid Mr. James Mansergh, who, with his assistants, had made a thorough investigation of the Company's accounts for several years past. It appeared that the called-up capital was £61,000, with a debenture debt of £14,850. On this capital the Company had paid maximum dividends for many years; and the continuous development of the undertaking was evidenced by the steady increase in the gross receipts, which were as follows: For the year ending Sept. 29, 1888, £10,181; 1889, £10,466; 1890, £10,855; and 1891, £11,244. Deducting from these sums the working expenses, the average net profit for the last four years amounted to £6964; while the net profit for the year ended Sept. 29 last was £7461. Mr. Mansergh also investigated the Company's sources of supply, machinery, reservoirs, and mains, and advised the Committee thereon. Negotiations then took place between the Committee and the Directors of the Company, which resulted in the former agreeing provisionally to purchase the property and rights of the Company, excluding cash balances and stores, for the sum of £200,000. It was proposed that the purchase should be settled on Sept. 29, 1892; and the Committee were of opinion that this date would enable the Corporation to make advantageous arrangements next summer for raising the purchase-money by the issue of Corporation stock, which the Committee had every reason to hope could be issued at such a price as would involve not more than 3¼ per cent. per annum interest. Mr. Mansergh was of opinion that it would be wise to obtain powers under the Act authorizing the transfer to issue further stock, to provide for the putting down of more powerful machinery and larger mains in many parts of the town. Under these circumstances, the Committee thought Parliament should be asked to sanction the issue from time to time as required of £230,000 of stock. The report concluded with a recommendation to the Council to promote the necessary Bill in the ensuing session of Parliament.

The MAYOR, in moving the adoption of the report, said the members of the Council were aware that this question was not a new one. It had many times in the past received a great deal of consideration from the Corporation; but never before had the matter reached the stage at which it had now arrived. He had no wish to delay the Council by going over the list of advantages to be gained by the Corporation in acquiring the undertaking; and he would only say this—that if they did purchase it, they would be following the example of a great many municipalities whose experience had proved beyond doubt that, on the score of health and of general convenience, it was the right and proper thing for a corporation to do, and that on financial grounds it had proved a source of benefit and of profit. The first practical question which naturally arose was, Were they paying too high a price for the undertaking? The price agreed upon provisionally was £200,000; and, with the costs of the Bill, the charges for floating the loan, the value of the stores, and a small working capital, they would require a loan of £208,000, at the outset. Under advice, they asked for an additional £22,000 on account of extensions of plant and mains, which the constant growth of the town would assuredly make necessary before the period covered by the loan had lapsed. He wished it, however, to be very clearly understood that there was no intention, and no need, to ask to borrow this extra £22,000 at the present time. It was put into the Bill simply to save having to go in the future to Parliament, and the considerable expense attending such a proceeding. The receipts of the Company for the year ending September last were £11,244; and deducting from this the working expenses (£3783), the net profit for the year was £7461. Therefore it amounted to this, that the required amount of £208,000 was equivalent to about 28 years' purchase of the net income on the basis of last year's revenue. Undoubtedly many transfers of similar property had been made at a lower price than this; but the natural and the inevitable consequence of a lower rate of interest upon good securities was to enhance the price of such undertakings. In 1878, the Stockton and Middlesbrough Water Company's undertaking was transferred to the Corporation at 26½ years' purchase. In 1886, the Corporation of Newport, Monmouthshire, gave 27¾ years' purchase for their undertaking; and more recently still, in 1888, the Windsor and Eton Company sold their undertaking for 33 years' purchase of the net income. From these figures, he thought it would appear that 28 years' purchase was not an unduly high price to pay. It might be contended that some of the plant of the Company was obsolete and insufficient, and that many of the mains were old and small. This was quite true; but it had been especially the subject of investigation on the part of Mr. Mansergh, and it had been also the subject of special negotiations with the Directors of the Company. The latter asked £213,000 for their undertaking; and if to this sum they added £8000—that was the cost incidental to obtaining the powers for purchase, for floating the loan, and so on—they had a total of £221,000. This sum worked out at 29·6 years' purchase upon the net income for the last twelve months. But as the result of their negotiations £13,000 had been taken off the first offer, on account of the condition of the mains and the plant; and he really considered that this was a very fair reduction to have succeeded in obtaining. The next question was, How would this large expenditure of money affect the rates of the town? Assuming that the £208,000 could be borrowed at 3¼ per cent. per annum for interest, they would have to provide £6760 per annum. The average increase of the net income of the Company during the past four years had been rather more than £200 per annum; and the steady growth of the town made it not unreasonable to rely upon a continuance of that increase. The net income of the Company for the year just ended was £7461; but as it was not likely that the Corporation could carry on the undertaking, at least at first, so economically as at present, he would take the net income at £7200 instead of £7461. Another year would pass before the Corporation would take possession, if the purchase were approved; and by that time they might fairly assume that the net income would have reached £7400. It would be necessary for them to form a sinking fund to pay off the loan in 50 years—that was, the term which they expected to get for borrowing the money; but they were advised that the starting of a sinking fund could be deferred for five years. Thus, during the five years, the only charge upon the net income would be the interest on the loan; and this would leave a balance of £640 each year, *plus* the increased business, amounting altogether to £4200 in the five years. That was five times the £640 per annum profit, together with the £200 increase that might reasonably be expected every year. In this five years, therefore, the sum of £4200 could be expended upon renewals of mains and plant. But this would not be sufficient; and the income would have to be supplemented by a rate in aid. It was proposed to begin with a rate of 1½d. in the pound, and to reduce it by a farthing in each year. Now, taking into consideration the increased assessment, which amounted to £4000 a year, how would this project work out? For 1892-3, a 1½d. rate on £220,000 would be £1374; 1893-4, a 1¼d. rate on £224,000 would be £1166; 1894-5, a 1d. rate on £228,000 would be £950; 1895-6, a ¾d. rate on £234,000 would be £724; and 1896-7, a ½d. rate on £236,000 would be £491—making a total of £4705. In this way, with a gradually reducing rate, they would be able in five years to expend altogether a sum of £8905 upon improvements and renewals; thus putting the undertaking into a thoroughly satisfactory condition. At the end of the five years, it would be necessary to form a sinking fund to pay off the loan in the 45 years that remained; and supposing they could invest the sinking fund at 3¼ per cent., this would require £2161 per annum, in addition to £6700 interest—altogether, £8861. Now they came to the first year after the five years had elapsed; and they found that for 1897-98 the net income of the undertaking might fairly be estimated at £8400. Add to this a halfpenny rate on an assessment of £240,000, which would bring in £500, they had £8900 to set off against the expenditure on interest and sinking fund of £8861. For the year 1898-99, the net income might be estimated at £8600; and the balance could be raised by a farthing rate on £244,000—making £8937 altogether. In 1899-1900, it would come to this—that the net income would reach £8800 per annum; so that it would scarcely be necessary to levy any rate at all to meet their liability on account of interest or sinking fund. Before concluding, the Mayor reminded the

members that, if the Corporation did not purchase the works now, they would have to pay an enormously increased price later on.

Mr. A. CATTERMOLE, in seconding the motion, pointed out that the water undertaking was sold to the Company a comparatively few years ago for a very small amount indeed.

Alderman MASON said he should not like the motion to be passed (as he hoped it would be) without saying a word or two, because he believed he was the only member of the present Council who was on the Corporation at the time the works were sold to the Company. So far from the bargain being a bad one, he said it was a good one. The water-works then consisted of a few reservoirs of very small capacity, and a pump on the marshes. A reservoir beneath the spot where they were assembled supplied the larger part of the town; so that the works were very insignificant—nothing compared to those in existence at the present time. He considered the Company had only asked a fair sum for their undertaking.

Alderman WRINCH, who said he had been on every Committee appointed for the purpose of acquiring the water-works, and had gone into the matter thoroughly during his mayoralty, spoke in favour of the purchase. The question had been brought forward on four different occasions; and the result had appeared to be precisely the same—viz., that the purchase would require a rate for about six years, and that afterwards there would be a profit. The undertaking could have been purchased 18 years ago at something like £100,000. He did not think the Corporation could possibly expect to purchase at a less price than that now asked; and if the town continued to progress, the worth of the works would increase.

Other members also spoke; all of them agreeing that the acquisition of the works was desirable.

The resolution was afterwards put and carried unanimously.

SEWERAGE AND SEWER VENTILATION.

At the Sanitary Institute last Wednesday, a paper descriptive of the sewerage of the town of Maldon, in Essex, and comprising some observations on recent practice in sewer ventilation, was read by Mr. R. F. GRANTHAM, M. Inst. C. E., a member of the firm by whom the works (recently completed) were carried out. They included not only the making of the main sewers, building storeage tanks, and constructing an iron outfall sewer for the discharge of the sewage into the estuary of the River Blackwater at certain times of the tide, but also the laying of the house connections, with their accompanying traps, air-inlets, and ventilating pipe-shafts. Maldon contains a population of about 5500 persons, occupying some 1250 houses. Of these about 1000 houses have been connected with the new system of sewers—representing a population of 4500; the sewerage of the remainder of the town being not yet undertaken. The method of dealing with the house connections, with the sewers carried round at the backs of rows of houses, was described by the author in detail; and he gave particulars of the lengths of sewers and of house connections, as well as of the numbers of man-holes, ventilating-shafts, lamp-holes, &c. With regard to ventilation, he pointed out that changes of opinion and practice have taken place within the last few years in regard to the matter. The primary conditions for preventing the accumulation of foul air are: Sufficient falls in the sewers, proportions to suit the expected volume of sewage, construction of the best kind, flushing where necessary, and as many openings as practicable into the outer air. Various plans—such as introducing trays of charcoal into the man-holes and lamp-holes—have been tried for deodorizing and purifying the sewer air before it escapes into the streets; but without permanent good effect. Tall shafts have a beneficial influence in the length of the sewers near them; but Mr. Grantham said this influence will be destroyed if there should be many inlets into the sewers near the junction with the shafts. It has been shown by Mr. Santo Crimp that the direction of measurable currents of air depends upon the force of the wind, and that they are as likely to be downhill as uphill when the wind is in that direction. The author referred to the case of the City of Memphis (U.S.A.), where no man-holes or lamp-holes were built on the lines of sewers, but the erection of an unobstructed pipe-shaft 4 inches in internal diameter, for the purpose of ventilating the main sewer, was made compulsory in every case of house connection; and an air-inlet was fixed at the lower end of each connection. Numerous upcast shafts for ventilating the main sewers have been erected in Croydon, Hornsey, Twickenham, and Liverpool; and some have been fixed in the City of London, in Birmingham, West Hartlepool, Maldon, and in Willesden Parish. In certain cases the street gratings have been closed; but in Hornsey, Croydon, and Maldon, they are for the most part left open, without causing any nuisance. Some difficulty has been experienced in getting permission to fix the shafts against the sides of houses; but nevertheless the practice is on the increase. The author therefore suggested that upcast shafts should in future form part of the designs of new systems of sewers. In view of the increase in the practice of erecting upcast shafts, and their beneficial influence in preventing the stagnation of air in the sewers, and considering the general adoption of the system of fixing similar pipes to house drains, Mr. Grantham thinks that future investigations should be conducted with the object of amalgamating the two systems of pipe-shafts, and doing away with syphon traps, in house drains outside the houses. He believes, from the evidence afforded by the examples of improvement in sewer ventilation due to the erection of upcast shafts, that in course of time such traps may be safely omitted.

The Wages of Gas Workers at Kingston-upon-Hull.—The men employed at the Kingston-upon-Hull Gas-Works have sent to the Manager a communication, in which they demand: That double time be paid for all work done on Christmas Day and Good Friday, and single time allowed to men who are not working on those days; time-and-a-half to be paid for all Sunday work; yardmen and purifying men to be advanced to 4s. per day for ordinary time, and time-and-a-half for overtime. Should these demands not be complied with, the men, it is expected, will leave work.

NOTES FROM SCOTLAND.

From our Edinburgh Correspondent.

EDINBURGH, *Saturday.*

It need be no matter of surprise that the experiment of the Dundee Gas Commissioners in appointing an Analyst for their gas coal should be a move of an infectious nature. When the remarks, appreciative in tone, of the Convener of the Committee which procured the appointment, are sympathetically reported, the general reader is apt to unthinkingly follow the speaker in his conclusions. That is to be expected; but the member of a Corporation should be able to discount statements emanating from an interested source. This, however, is what Bailie Rust, of the Aberdeen Town Council, seems unable to do; for at a meeting of the Council on Monday he took the liberty of interpellating, as the French say, the Convener of the Gas Committee on the subject of coal analysis, with special reference to the Dundee results. He had, he said, seen "a paragraph in the papers," from which he learned that "the Dundee Gas Committee" (observe his inattention to realities) had rejected coal; and he wished to know if the Aberdeen Gas Committee were quite sure that the coal they were getting was up to the mark. Bailie M'Kenzie, the Convener of the Committee, effectually disposed of the questioner. Until last year, he said, all corporations, in Scotland at least, disregarded the analyses of coal-owners, and bought upon analyses of their own. In Dundee, however, they had since gone upon the coalowners' analyses; and they now discovered that these could not be always correct, because coal differed from time to time. "Hence they had got into a mess with the contractors over it." In Aberdeen they bought on their own analyses; and they frequently tested the coal to see that they were getting, on an average, what they had bargained for. I am thankful for Bailie M'Kenzie's statement; because it bears out the views I have given in this column on several occasions, to the effect that the employment of an analyst such as the Dundee Gas Commissioners have now in their service, will not be much of a help to the Commissioners, that it may lead them into serious trouble, and that it is unnecessary. An efficient Gas Manager, such as the Dundee Gas Commissioners possess in Mr. M'Crae, is quite capable of protecting them in the matter of the quality of the coal.

Want of knowledge, not to use such a strong term as ignorance, on the part of men in public positions, is unfortunately too common. Besides the incident at Aberdeen, I am obliged to take notice of another at Dundee, where, at a Police Commissioners' meeting on Thursday, Bailie Ferrier, after pointing out that the gas was reported to be of 25·73-candle power, asked if there was any agreement with the Gas Commissioners to supply gas of any particular illuminating power. This worthy magistrate was quite oblivious of the fact that the Dundee Gas Commissioners carry on their work under statutory powers; and he seemed astonished when the Clerk informed him that the Gas Commissioners were obliged to supply gas of not less than 18-candle power. The surprising thing to me is how a man with so little local knowledge could ever have been selected to fill the office of magistrate. He could not have supposed that the Police Commission could have imposed, by agreement, a higher standard of light than that which the Gas Commissioners are bound by the Legislature to conform to. If they attempted it, such an agreement would not be worth the paper it was written on; because no prosecution would lie on any other foundation than that of the Commissioners' Act of Parliament. These two incidents show that the gas industry is not in the best hands when it is managed by a corporation—the reason being, of course, that members of corporate bodies are elected on other grounds than their fitness for the carrying on of commercial undertakings.

Mr. T. D. Hall manages the affairs of the Montrose Gas Company so well that it is exceedingly rare that anything he does is brought under the notice of the public. In that respect he may be said to be happy in having "no history." He emerges, however, from his obscurity this week; and it is a satisfaction that he does so in a connection which shows him to advantage. The Harbourmaster had complained of a want of light at the dock; and his letter was handed to Mr. Hall, who recommended that a gas-fitter should be called in to repair the services, which were in a very bad condition. It speaks volumes for the confidence which is reposed in Mr. Hall that the Harbour Trustees, instead of, as is too frequently the case, flouting his proposals and throwing out insinuations regarding the rapacity of the Gas Company, adopted his suggestions and gave instructions for a general overhaul of the fittings. An incident like this, it is a pleasure to record.

After the collapse of the proposals for the acquisition by the Corporation of the Dunfermline Gas Company, the Company have taken the step which it was the intention of the promoters of the transfer proposal to prevent. The Company have now been incorporated, with a capital of £60,000 in £25 shares. It has hitherto been of the co-partnery order, formed for a period of years. With the end of November last one of these periods expired; and the members have seen it to be their interest to form themselves into a more permanent body. The Company was registered this week in Edinburgh as a joint-stock company. Hitherto the capital has been £25,462; the number of shares issued being 1455, and each share being £17 10s., fully paid up. The new capital is to consist of 2400 shares; and the old shares are to be held as of the full value of £25, fully paid up. With this large increase of capital, it is proposed to remove the gas-works from their present site in Rolland Street, to Grange Road, in the suburbs, where the Company already possess sufficient land to accommodate them. This transfer of the works is rendered necessary by the great increase in the gas consumption, which has risen from 20 million cubic feet twenty years ago, to 70 million cubic feet at present. The removal of the works and their renovation will be carried out under the supervision of Mr. W. Mackenzie, the veteran Manager of the Dunfermline Gas-Works. Mr. Mackenzie has been ailing for a considerable time; but, I am glad to say, he is now restored to health, and is actively engaged in his duties. His son, Mr. John Mackenzie, who has received his training in the Glasgow Corporation Gas-Works, has been appointed Assistant-Manager, and he will doubtless be of much service in the carrying out of the transfer. With this move on the part of the

Company, the Corporation have lost their opportunity of acquiring the undertaking; as the terms upon which a transfer could be effected will now be much higher than they would have been under the old capital and with the overcrowded and old works.

From our Glasgow Correspondent.

GLASGOW, *Saturday*.

I am told that considerable difficulty is being experienced by the Glasgow Gas Trust Sub-Committee on Contracts, in consequence of the unsatisfactory manner in which a number of the contractors are meeting the demands being made upon them for the coals required at the various works belonging to the Trust. The needs just now are something like 2500 tons per day. Negotiations have been opened with quite a number of colliery-owners and merchants who were not placed on the lists at either of the contracting times of this year; and as coal must be had "by hook or by crook" to meet immediate wants, the matter of price is not allowed to stand in the way of bargains being made here and there. The prime question for consideration is prompt and regular delivery, so as to tide over the dark days and long nights of the next few weeks. In some instances the firms which have come to the help of Mr. Foulis are rejoicing over the excellent prices that they are getting—practically their own terms. In one case, application has been made to the Contracts Sub-Committee by a gas-coal company to have their current contract cancelled, so far as regards the balance of the coal still remaining undelivered. The request has been granted by the Committee. By-and-bye the question of enforcing the penalties on the defaulters may have to be considered.

The new members of the Glasgow Corporation Gas Committee, accompanied by several of the old members, paid their first visit last week to the Dalmarnock, Tradeston, Dawsholm, and Temple Farm gas-works; and it is said that in the case of one or two of them, if not more, they made their first acquaintance with the inside of a gas-works. One of the new men tells me that the excavation for the immense gasholder tank at the Temple Farm works is making capital progress. I know that fully a fortnight ago the contractor, Mr. Robert M'Alpin, received his first instalment of the payment therefor, the amount of it being £2250, or well-nigh one-eighth of the amount of the tender.

Having made mention of the Temple Farm and Dawsholm works, I am reminded of the fact that the portion of ground on which they are situated is within the county of Dumbarton, and that the Glasgow Corporation Boundaries Committee are exceedingly desirous of making the ground in question a portion of Greater Glasgow for convenience in the way of administering the law, the collection of taxes, &c. Negotiations have for some time been in progress between that Committee and a Committee of the Dumbarton County Council, with a view to arriving at an agreement mutually satisfactory to County and City. At a conference held in October, the Dumbarton Committee submitted a minute embodying terms that would be satisfactory to the County. It said that the Committee were of opinion that the annual valuation of the works should be assumed for the future at the average of the last five years, the future assessments at a shilling per pound, and that fifteen years' purchase of the rates which would be levied on that principle should be asked for consenting to the transference of the works to Glasgow, which would ensure their immunity from County taxation. The Corporation representatives intimated that they could not entertain the County's proposal as a basis for settlement; and it was agreed that the Corporation Sub-Committee should further consider the County's proposal, and make a counter proposal, should they see their way to do so. After the lapse of a fortnight, the Glasgow Sub-Committee held a meeting at which they gave full consideration to the County's proposal; and eventually they agreed to offer, as compensation for the two gas-works and the Dawsholm Chemical Works, a sum equal to ten years' purchase of the rates leviable upon them for the current year. The Town Clerk was instructed accordingly. Towards the middle of last month another meeting of the Glasgow Committee was held, at which the correspondence with the Dumbarton County Council was submitted. After considering it, and in the hope that they might shortly be able to arrange the claim, the Committee gave instructions that the area of land in question should be included in the notice to be given in one of the Bills to be promoted by the Corporation in the ensuing session of Parliament. Another conference of the County and City representatives was held on the 18th ult., but as neither party showed any disposition to give way, the negotiations were brought to an end, and the conference terminated.

In various parts of the country there are small gas concerns in non-progressive villages and townships which are meeting with very considerable difficulty in their endeavours to cause ends to meet. They are put to severe straits by the high price of coal; and if they attempt to advance the price of gas numerous consumers threaten that they will resort to the use of paraffin oil. The village of Ochiltree, in Ayrshire, is a case in point. Some days ago the shareholders of the local Gas Company held a meeting, at which their present position and future prospects were carefully and anxiously considered, with the result that it was unanimously resolved to dissolve the Company and to proceed to liquidation. Of course, it is only a small concern—the capital amounting to £800 in £1 shares.

This week's pig-iron market has been a very quiet one. No transactions in Scotch warrants have been reported, but there are still buyers at 47s. per ton cash. Both hematite iron and Cleveland warrants have been easier this week; and the closing prices yesterday afternoon were, respectively, 47s. 5½d. and 37s. 10d. per ton cash buyers. The demand, as is usual at this time of the year, is somewhat quiet, and rather more iron has lately been going into the warrant stores.

The Glasgow and West of Scotland coal trade has been steady all the week, with practically no special feature. However, with quotations lower in the North of England and South Wales, the opinion is that if the demand is to be sustained prices here will require to yield. At the moment the inquiry is a steady one, owing to most of the works being engaged with orders which finish at the end of the year; and consequently the output is cleared away. In most districts a scarcity of waggons is reported. The export trade has been fairly good, rates having stiffened a bit. It is understood that Irish orders are being withheld with the view to getting lower prices. The shipments, while not up to those of the previous week, were good; and it is calculated that at the end of the year the increase over the last twelve months will be close upon a quarter of a million tons. Main has remained at 8s. per ton f.o.b., and splint at 9s. to 9s. 3d. Household sorts have been dull, in the absence of the cold weather usual at this season. As to steam qualities, they are quiet, and inclined to droop in price.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Dec.* 12.

Sulphate of Ammonia.—The market has a somewhat steadier appearance; and a fair amount of business has been transacted. The quotations run about £10 5s.; but, in most cases, buyers refused to exceed £10 2s. 6d. to £10 3s. 9d. There is a better inquiry all round; and, unforeseen circumstances excepted, we seem to be on the eve of better things, and it is becoming generally recognized that sulphate is at too low a point. Considering the time of the year, the quantities on the market are by no means large; and the bulk of the make is likely to be absorbed before the end of 1891. Nitrate is a shade easier, and can be bought at 9s. 1½d.

LONDON, *Dec.* 12.

Tar Products.—Business in these continues dull; and there seems now but little chance of improvement till after the turn of the year. Benzols have still further dropped; and business in 50's has been spoken of at 1s. 10½d. The great depression no doubt arises from the urgency of sellers to clear their stocks, and the disinclination of buyers to take delivery until after the close of the year, to simplify stock-taking. Creosote and oils are likewise easier; and anthracene has but little life. Carbolic acid has likewise dropped. Prices may be taken as follows: Tar, 19s. to 23s. Pitch, 33s. 6d. Benzol (nominal), 90's, 3s.; 50's, 2s. Toluol, 1s. 3d. Solvent naphtha, 1s. 2½d. Crude naphtha, 1s. Creosote, ⅝d. to 1d. Cresol, 8½d. Carbolic crystals, 5d.; crude, 60's, 1s. Anthracene, "A" quality, 1s. 2d.; "B," 10d.

Sulphate of Ammonia.—This also has had a further drop—brought about, no doubt, by the forced sales in London. The heavy make, and the necessity of clearing out stocks, all help to weaken the market; and until buyers are more active, there does not seem much prospect of improvement. Price: £9 15s. to £10 2s. 6d., less 3½ p. ct.

THE LANCASHIRE GAS COAL TRADE.

From Our Own Correspondent.

A generally dull tone continues throughout the coal trade of this district; and although the better qualities of round coal move off fairly well for house-fire purposes, other descriptions generally hang upon the market, and supplies of common sorts of engine fuel continue far in excess of requirements. House fire coals do not more than maintain late rates—best qualities averaging 12s. 6d.; seconds, 10s. 6d. to 11s.; and common sorts, 9s. to 9s. 6d. per ton at the pit mouth. The lower qualities of round coal, owing to the decreasing demand for iron making and other industrial purposes, are hanging upon the market; and with not only plentiful local supplies, but considerable quantities coming in from outside districts, colliery proprietors are finding it difficult to fully maintain late rates. For shipment also the demand is only indifferent; and prices continue comparatively low. At the pit mouth good steam and forge coals do not average more than 8s. to 8s. 6d.; and for delivery at the ports on the Mersey, ordinary descriptions of steam coal can be readily bought at 9s. 6d. up to 10s. per ton. The best classes of engine fuel are not difficult to dispose of; but while common sorts are still generally a drug, there is continued weakness in prices, and surplus lots are pushed for sale at extremely low figures. At the pit mouth, burgy ranges from 6s. to 6s. 6d., up to 7s. for some special sorts; best slack, 5s. to 5s. 6d.; good ordinary sorts, 4s. to 4s. 6d.; and common, about 3s. per ton.

Northern Coal Trade.—The steam coal trade for the last few days has been quieter; but there has been a desire to get off coals before the beginning of the holiday season, so that the collieries have been on the whole fairly well employed. The large contracts for the North-Eastern Railway Company have been, in a number of instances, settled for next year, and that at a reduction on this year's contracts, varying from 1s. to 1s. 3d. per ton. Steam coal is now generally quoted at about 10s. 3d. per ton free on board, though there have been sales both above and below that price. Small steam coal is quiet; and second-class steam is about 9s. to 9s. 6d. per ton free on board. Gas coal is very firm; the demand having increased during the stormy weather, and the output has been fully taken up on contracts. The general price for cargoes is from 9s. 3d. to 9s. 6d. per ton free on board. Bunker coal is quiet, at from 8s. upwards for unscreened qualities, and as high as 12s. for the best screened qualities from Durham collieries. Coke is steady; but the chief contracts for gas coke are being slowly arranged—buyers wishing to pay only 10s. per ton.

The Charge for Water for Trading Purposes at Liverpool.—On the suggestion of the Chairman (Alderman John Hughes), the Water Committee of the Liverpool Corporation last Tuesday passed a resolution instructing their Water Engineer (Mr. Parry) to consider whether he would, on the completion of the Vyrnwy works, be in a position to recommend a reduction in the price of water for trading purposes. In the course of the discussion on the matter, one member stated that he believed many capitalists would be induced to come to Liverpool if a cheap supply of water could be given them; while another member impressed upon the Committee the importance of relieving the rates by selling water to other districts. It was also mentioned that, when the Vyrnwy works were completed, there would be a daily supply of 33 million gallons—12 millions from Rivington, 6 millions from wells, and 15 millions from Vyrnwy. The consumption in Liverpool is 18 million gallons daily; so that there will be a large margin to supply not only manufactories but other districts.

Electric Lighting for Richmond (Surrey).—At the meeting of the Richmond Town Council last Tuesday, a 30 years' contract was sealed with Messrs. Latimer Clark, Muirhead, and Co., Limited, for the electric lighting of the borough.

The Dangers of Natural Gas.—According to a telegram received through Dalziel's agency, there were four explosions of natural gas in the town of Rodney (Montana) last Thursday, causing the destruction of four blocks of business premises and 25 dwelling-houses. Ten persons are reported to have been killed; and the town is practically ruined.

British Water Gas Syndicate.—The second annual general meeting of the shareholders in this Syndicate was held at Leeds on Friday last. Mr. Samson Fox presided; and, in moving the adoption of the report, an abstract of which appeared in the JOURNAL last week, expressed the Directors' regret at being unable to declare some profit on the business. However, nothing had, he said, occurred to interfere with the probable adoption of water gas. The Gaslight and Coke Company had taken up the matter, and had employed the United Gas Improvement Company, of Philadelphia, to erect the plant. Some of the shareholders expressed dissatisfaction with the state of the Company's affairs; and a motion was brought forward suggesting the appointment of a Committee of Investigation. This, however, was not seconded; and the report was adopted.

Flooding of the Widnes Gas-Works.—Owing to the prevalence of rain in the early part of last month, the Widnes Gas-Works were within 18¼ inches of the flood-line of the corresponding month in 1886; and the water was just beginning to rise in the lower parts of the works, when fortunately the rain ceased, and no damage was done. The cause of this flooding is the proximity of Bower's Brook; and the Gas and Water Engineer of the Local Board (Mr. Isaac Carr) has reported to his Committee that the liability of the brook to flooding jeopardizes the constant supply of gas to the town. In view of this report, the Committee decided to recommend the Board to take the matter into consideration. This was done at their meeting last Tuesday, when a deputation was appointed to wait upon the Directors of the United Alkali Company, who, it appears, are the parties responsible, and represent to them the serious position of affairs. The gas-works have in times past sustained considerable injury from flooding; and naturally neither Mr. Carr nor the Committee desire to have the responsibility of keeping up the supply of gas to the town with the liability to a recurrence of this trouble hanging over them.

The Gas-Works "Nuisance" at Coventry.—In the course of the proceedings at the meeting of the Coventry City Council last Tuesday, Mr. West asked whether the "unfortunate residents" in the neighbourhood of the gas-works might hope for a diminution in the amount of smoke thrown off from the works, and also a diminution in the intolerable smell arising from the works. It would, he said, be remembered that a petition was sent from several hundred ratepayers some time ago asking for the nuisance to be abated. Mr. Andrews (Chairman of the Gas Committee) replied that the memorial referred to had been considered by the Gas Committee twice or three times, and would also be under their consideration at the next meeting; but the memorial asked for the removal of the whole of the gas-works from the city. That would necessitate the expenditure of something like £100,000, and would leave them in exactly the same position as regarded the manufacture of gas as at present. He asked the Council whether they were prepared to fling away £100,000 in this way. With regard to the smell, he did not know whether there had been anything unusual of late; but it was not possible to carry on the manufacture of gas without any smell at all. He assured the Council, however, that everything would be done to keep down any nuisance of that kind; but it could not be entirely avoided.

Rushden Gas Supply.—A rather unusual state of affairs prevails just now in connection with the gas supply of Rushden, in Northampton. First of all the Gas Company in that town have had before them a project of amalgamating with the Higham Ferrers Gas Company; while the Local Board appear to be desirous of acquiring the undertaking. In face of the present incapacity of the works to meet the requirements of the consumers, the Directors decided to recommend the erection of new ones on a fresh site, and to ask the shareholders to sanction the amalgamation of the two Companies, or rather to assist in the formation of another Company to take over both concerns. The matter came before the proprietors at a meeting recently held, under the presidency of the Chairman (Mr. R. O. Butcher), when a proposition was submitted that, in the event of the Local Board expressing their wish to purchase the undertaking, the price should be arrived at by valuation. The feeling of the meeting being decidedly in favour of this course, it was agreed to. A resolution was then proposed by Mr. J. T. Lewis (of Wellingborough) in favour of an amalgamation with the Higham Ferrers Company, and the erection of new works for the supply of both towns. It was explained that this would not interfere with a sale of the property to the town, as proceedings could be stayed at any moment if the Local Board came to a decision to purchase. This resolution was also carried. The subject was introduced at the meeting of the Board on the 3rd inst., when the Chairman (Mr. W. H. Wilkins) explained what had been previously done. The question had been referred to the Vestry, who had recommended the purchase; but a difficulty had arisen owing to a motion authorizing the Clerk to apply to the Company for their terms being lost by equality of voting. However, the ground had, he said, been cleared by the Company expressing their willingness to part with their undertaking on terms to be settled by valuation. This statement was not very favourably received; one member expressing the opinion that the Board ought to have acted upon the suggestion to apply to the Company for their terms. After a somewhat lively discussion, the matter was referred back to the Vestry, who, at a meeting held last Thursday, passed a resolution expressing the opinion that it was desirable that the supply of gas should be under the control of the Local Board, and requesting that body "to obtain the sanction of the Local Government Board to acquire, by equitable valuation, the property of the Gas Company, and to enlarge the existing or construct any new works necessary for providing an adequate supply of gas for the parish."

The Valuation of Machinery for Rating Purposes.—Under the re-valuation of the Swansea Union which has been in progress for some time, several appeals have arisen, and been taken to the Glamorganshire Quarter Sessions. One of these appeals, which was by agreement referred to the arbitration of Mr. S. Green, F.S.I., of London, involved a question which has given rise to much heart burning—viz., the correct method of dealing with machinery for rating purposes. The Arbitrator, having held several sittings, at which Mr. Eve appeared for the Union, and Mr. Humphreys Davies, Surveyor to the National Association of Machinery Users, for the appellants, has now made his award, reducing the assessment from £1756 to £1412, and ordering the costs of the arbitration to be paid by the Assessment Committee and the Overseers.

The Leakage from the Dammflask Reservoir at Sheffield.—According to the minutes presented by the Water Committee at the meeting of the Sheffield Town Council last Wednesday, at the end of August last, Messrs. T. and C. Hawksley and Professor Green made a careful inspection of the wing trench, now being excavated on the south side of the Dammflask reservoir, with the object, when refilled with water-tight materials, of preventing the passage of water from the reservoir through the fissures in the natural rocks into the adjacent ground, and thence flowing into the valley of the River Loxley below the site of the reservoir. At that time the excavations were not sufficiently completed to enable them to form a satisfactory opinion on certain points to which researches had not then reached. They therefore made some suggestions with respect to further investigations. The Resident Engineer has since placed before them the results of those investigations to the extent to which they have at the present date been extended. They are, therefore, in a position to report that, in their joint opinion, the process of refilling with water-tight materials may now be advisedly commenced, and be carried on from the east end of the trench for a longitudinal distance of about 850 feet, and to a level above Ordnance datum of about 860 feet. They express the opinion that the contemplated works will either totally arrest the percolation of water from the southern side of the reservoir, or at least reduce it to an insignificant and harmless amount. The Committee have accordingly instructed their Engineer (Mr. E. M. Eaton) to proceed with the work.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 1081.)

Issue.	Share	When ex-Dividend.	Dividend & or Div. & Bonus.	NAME	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	15 Oct.	10½	Alliance & Dublin 10 p. c.	10	15½–16½	..	6 7 3
100,000	10	,,	7½	Do. 7 p.c.	10	11–12	..	6 5 0
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	106–108	..	4 12 7
100,000	20	27 Nov.	8	Bahia, Limited	20	12–14	..	11 8 6
200,000	5	12 Nov.	7½	Bombay, Limited	5	6½–6¾	..	5 11 1
40,000	5	,,	7½	Do. New	4	4¾–5	–¼	6 0 0
380,000	Stck.	13 Aug.	12½	Brentford Consolidated	100	210–220	..	5 11 4
125,000	,,	,,	9½	Do. New	100	157–162	..	5 14 2
220,000	20	16 Sept	11½	Brighton & Hove Original	20	40–42	..	5 9 6
888,500	Stck.	16 Sept.	5	Bristol	100	101–104	–1¼	4 16 2
320,000	20	15 Oct.	11½	British	20	42–44	..	5 2 3
50,000	10	28 Aug.	11½	Bromley, Ordinary 10 p. c.	10	18–20	..	5 15 0
50,380	10	,,	8½	Do. 7 p. c.	10	13–15	..	5 13 4
328,750	10	—	—	Buenos Ayres (New) Limited	10	6–7	..	—
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	92–96	..	6 5 0
150,000	20	13 Aug.	8	Cagliari, Limited	20	24–26	..	6 3 1
550,000	Stck.	15 Oct.	13¾	Commercial, Old Stock	100	240–250	..	5 10 0
161,396	,,	,,	10¾	Do. New do.	100	185–195	..	5 10 3
130,000	,,	26 June	4½	Do. 4½ p. c. Deb. do.	100	119–124	..	3 12 7
800,000	Stck.	11 June	10	Continental Union, Limited	100	220–225	+2½	4 8 10
200,000	,,	,,	7	Do. 7 p. c. Pref.	100	190–200	..	3 10 0
75,000	Stck.	16 Sept.	10	Crystal Palace District	100	190–200	..	5 0 0
486,090	10	15 July	10	European, Limited	10	19–20	..	5 0 0
354,060	10	,,	10	Do. Partly paid	7½	14–15	..	5 0 0
5,470,640	Stck.	13 Aug.	13	Gaslight & Coke, A, Ordinary	100	225–230	½	5 13 0
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	94–97	..	4 2 5
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	248–253	..	3 19 1
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	118–123	..	4 1 4
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	172–177	..	4 4 9
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	157–161	..	4 6 11
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	245–250	..	4 0 0
476,000	,,	,,	—	Do. K, 6 p. c. Prf.	100	145–155	..	3 17 0
1,061,150	,,	11 Dec.	4	Do. 4 p. c. Deb. Stk.	100	110–114*	+½	3 10 2
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	118–123*	+½	3 13 2
908,000	,,	,,	6	Do. 6 p. c. do	100	160–165*	..	3 12 9
3,800,000	Stck.	12 Nov.	12	Imperial Continental	100	216–221	+2	5 8 7
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	5	4–4½*	..	6 13 4
560,000	100	1 Oct.	5	Met. of Melbourne, 5p. c. Deb.	100	109–117	..	4 10 1
541,920	20	27 Nov.	6¾	Monte Video, Limited	20	15–16	..	8 2 6
150,000	5	27 Nov.	10	Oriental, Limited	5	8–8¼	..	5 17 8
60,000	5	30 Sept.	7	Ottoman, Limited	5	4–5	..	7 0 0
166,870	10	26 Feb.	2	Park Limited	10	2¾–3¼	..	—
420,000	100	3 Nov.	6	People's Gas of Chicago— 1st Mtg. Bds.	100	94–99	+4	6 1 3
500,000	100	1 Dec.	6	2nd Do.	100	93–98	+5	6 2 5
150,000	10	15 Oct.	10	San Paulo, Limited	10	12–13	..	7 13 10
500,000	Stck.	28 Aug.	15½	South Metropolitan, A Stock	100	265–275	..	5 12 9
1,350,000	,,	,,	12	Do. B do.	100	222–226	..	5 6 3
200,000	,,	,,	13	Do. C do.	100	225–235	..	5 10 8
700,000	,,	26 June	5	Do. 5 p. c. Deb. Stk.	100	140–145	..	3 9 0
600,000	Stck.	16 Sept.	11½	Tottenham & Edm'nton, Orig.	100	—	..	—
				WATER COMPANIES.				
729,331	Stck.	26 June	10	Chelsea, Ordinary	100	255–265	..	3 15 6
1,720,560	Stck.	15 Oct.	8	East London, Ordinary	100	195–205	–2½	3 18 0
544,440	,,	26 June	4½	Do. 4½ p. c. Deb. Stk.	100	138–143	..	3 3 0
700,000	50	11 Dec.	8	Grand Junction	50	97–103*	–2	3 18 5
708,000	Stck.	13 Aug	10½	Kent	100	257–262	..	4 0 2
1,043,800	100	26 June	9½	Lambeth, 10 p. c. max.	100	230–235	..	4 0 10
406,200	100	,,	7½	Do. 7½ p. c. max.	100	192–197	..	3 16 2
260,000	Stck.	30 Sept.	4	Do. 4 p. c. Deb. Stk.	100	120–123	..	3 5 0
500,000	100	13 Aug.	12½	New River, New Shares	100	330–340	..	3 11 4
1,000,000	Stck.	30 July	4	Do. 4 p. c. Deb. Stk	100	125–127	+1½	3 3 0
902,300	Stck.	11 June	6½	S'thwk & V'xhall, 10p. c. max.	100	150–160	..	4 1 3
126,500	100	,,	6½	Do. D 7½ p. c. do.	100	140–150	–10	4 6 8
1,155,066	Stck.	11 Dec.	10	West Middlesex	100	240–250*	..	4 0 0

*Ex div.

Workington Corporation Gas-Works.—The Manager of the Workington Corporation Gas Undertaking has reported that all the extensions at the works have now been completed. A new retort-bench of 24 retorts has been fitted up; and is ready for use whenever required. The entire cost, including both materials and labour, has been £537. The works are now in a position to make 425,000 cubic feet of gas in 24 hours, as against 281,500 feet previously.

The Fatal Gas Explosion at Knightsbridge.—Last Wednesday, Mr. Troutbeck, the Coroner for Westminster, held an inquiry, at St. George's Hospital, into the circumstances attending the death of John Ignatius Kirkman, aged 29 years, a painter, who died from injuries sustained at Albert Gate Mansions, through the gas explosion which occurred there on the 4th inst., as recorded in the JOURNAL last week (p. 1056). The evidence was to the effect that the deceased, along with other workmen, was engaged decorating the interior of the house. The gas had been cut off on the third and fourth floors, but not on the second; and here an escape of gas was perceptible. The first floor was composed of concrete, from which the ceiling underneath depended. There was between the floor and the ceiling a cavity containing the gas-pipes; but Mr. Humphreys, the builder and freeholder of the mansions, denied that the pipes were in the cavity. They were on the top of the concrete, and under the asphalte which was laid above. In witness's opinion the gas must have accumulated in the cavity by means of a crack in one of the pipes, although he could not discover a defect in any of them. Captain Simonds, Chief Officer of the Metropolitan Fire Brigade, said he had examined the premises since the fire. The ceiling on the ground floor was completely destroyed; but the concrete floor above did not seem to have been disturbed. He was of opinion that an explosive mixture of gas and air had been accumulating in the cavity for some considerable time. He thought there was a leakage by means of which the gas reached the second floor. He was shown a place where the gas-fitter stated that he had applied a light, and, from his experience, he did not think it a careless act, knowing that there was a solid concrete floor. Hermann Goldenberg, a plumber and gas-fitter, stated that, on the day of the accident, he was informed by a workman that he had discovered an escape of gas. After dinner witness went to the first floor, and, stooping down, he perceived a slight escape. He lighted a match, and applied it to a crevice in the floor, through which a gas-pipe ran, and nothing happened. He applied a second light, and then another; whereupon the explosion occurred. Witness was uninjured. The jury returned a verdict of "Accidental death."

Institute of Secretaries.—The Council of this Institute notify that the first election of candidates for Fellowship will take place on the 19th inst.

The Borrowing Powers of the Sheffield Corporation Water Department.—The Sheffield Town Council have received the sanction of the Local Government Board to the borrowing of £3610 for water-works purposes.

The New Water-Works for Pontefract.—The contractors for laying the mains from the new pumping-station at Roall, near Whitley Bridge to the reservoir on the Park Hill at Pontefract—a distance of nine miles,—have completed this important part of the water scheme. The engines are expected to be placed in position at Roall about April next, when Pontefract and the district will receive an unlimited supply of pure water. At present the town is only supplied for a few hours daily.

Plymouth Corporation Water Supply.—After considerable discussion at the meeting of the Plymouth Borough Council last Wednesday, the following recommendations of the Water Committee were adopted—(1) That 20 of Deacon's waste-water meters be purchased at a cost of £785; that an assistant to the Water Engineer be advertised for at a salary of £100 per annum, to be raised by four annual increments to £140 per annum; and (3) that application be made to the Local Government Board for sanction to borrow the sum of £3100, the amount spent on the Drake's Place reservoir and adjacent grounds in excess of the authorized borrowing powers.

Yorkshire Water Gas Company.—The annual report of the Directors of this Company states that, although there has not been so large a business as the Directors would have wished, what has been done is almost entirely satisfactory. The plant at the Lancaster Waggon-Works is quite completed, and operating to the satisfaction of the Waggon Company. That at Messrs. Moss Brothers' works at Eastwood, used for fustian singeing, continues to be a success. During the year the experiments in carburetting water gas have been continued; and they indicate, it is stated, that the gas is fully equal to, and cheaper than, coal gas. The Directors have only taken their fees for three quarters of the year, and have passed a resolution not to draw any further fees until the Company is in a more flourishing condition. Owing to the arrangements they have made with their bankers, they do not anticipate that it will be necessary to make any call for a long time to come. They draw attention to a considerable reduction in the expenses of the Company, although more business has been done this year than last.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

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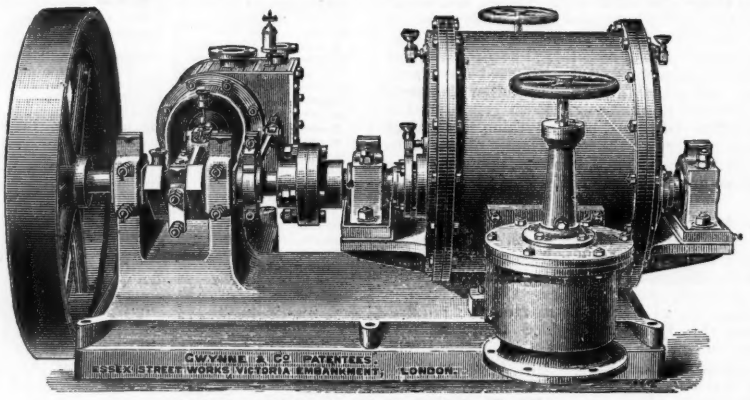
HYDRAULIC AND GAS ENGINEERS, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co., for Gas Exhausters, &c.

They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality.

The result is that in every instance their work is giving the fullest satisfaction.

They have completed Exhausters to the extent of 30,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work, and can be referred to.



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GWYNNE & Co.'s Exhausters are constructed of large size to pass the required quantity of Gas at very slow speeds; the wear and tear being reduced to a Minimum.

Catalogues and Testimonials sent on Application.

Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

NO OTHER MAKER CAN DO THIS.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; PATENT SELF SEALING AND CLEANSING RETORT-LIDS AND MOUTHPIECES; CENTRIFUGAL PUMPS and PUMPING ENGINES specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.

JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

ANDREW STEPHENSON, Agent. Please address all communications to the Company, as above.

ANDREW STEPHENSON, Agent for BRIN'S OXYGEN COMPANY, Limited, Westminster, S.W.

City Address: 182, Gresham House, Old Broad Street, LONDON, E.C.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.

Postal Address: 1, WHITTINGTON AVENUE, E.C.

Telegram Address: "EIRWAL LONDON."

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*** See Advertisement p. 1105 of this week's issue.

Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

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JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

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NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH.
Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, St. Andrew Square, Edinburgh, / Newton Grange, near Dalkeith, } Scotland.

FRIEDRICH LUX, Ludwigshafen am Rhein; and at No. 142, Great Portland Street, London, W.
Lux's Gas Regulators for every consumption.
Lux's single-stem Pressure-Gauges.
Lux's Regulator for Gas-Engines.
Lux's Gas-Balance.
Lux's new Gas Regulator for Inverted Lamps; and other Apparatus for Gas Lighting, &c.

DRAWINGS, Tracings, Specifications, Quantities, &c., prepared by an experienced Engineering Draughtsman. Plans of Works made, copied, or enlarged. Blue copies made. Illuminated Addresses in first-class style. Writings of all kinds, Engrossments, &c.
Address J. L. Featherstone 173, Fentiman Road, London, S.W.

TO GAS COMPANIES AND COMMITTEES.

THE Advertiser seeks re-engagement as MANAGER of Gas-Works.
Apply to No. 2047, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, a position in Draughtsman's Office or Laboratory in Gas-Works by a Young Gentleman just leaving School. Can have the highest recommendations.
Address No. 2045, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, near London, a thoroughly capable man as SERVICE LAYER and GAS-FITTER. One who has been accustomed to fixing Gas-Stoves preferred.
Apply, by letter, to No. 2049, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WORKING MANAGER wanted, to take charge of small Works. Help in winter. £1 per week, with House, Coal, and Gas.
Apply, with references, and full particulars, to the Secretary, Gas Company, South Petherton, Somerset.

£5000 CAPITAL.

A GOOD opportunity presents itself for an Electrician to join Advertiser (a Mechanical Engineer of long and varied experience, with very large connection) in DEVELOPING an ENGINEERING BUSINESS, and adding an Electrical Branch. Capital absolutely secure. Principals only dealt with.
Apply to Daniel Jones and Linnett, Solicitors, 1, Quality Court, Chancery Lane, W.C.

ADVERTISER is prepared to purchase High Percentage GAS LIQUOR. Also CRUDE LIQUID AMMONIA, 15 to 20 per cent. Good price paid.
Address No. 2042, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

FOR SALE, very Cheap—Bound Volumes (27 to 32 and 45 to 48) of the JOURNAL OF GAS LIGHTING.
Apply, by letter, to No. 2048, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

THE Directors of the Farnworth and Kearsley Gas Company are prepared to receive TENDERS for the sale of about 130 tons of SPENT OXIDE.
Samples may be obtained by application to the undersigned.
Tenders to be addressed to James Warburton, Esq., Chairman.
J. L. Sheppard, Manager.

TAR and Liquor wanted.
Brotherton and Co., Commercial Buildings, Leeds.

SADLER AND CO., LIMITED, Middlesbrough; Ulverston (Barrow); Portsmouth; Carlton; Stockton; 70, Wellington Street, Glasgow; 58, Fountain Street, Manchester; and 85, Water Street, New York. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: Middlesbrough. Correspondence invited.

TO GAS ENGINEERS AND OTHERS.

TO LET—The Works and Plant of the Littleport Gas Company, Limited, at Littleport, Cambridgeshire. Last year between 400 and 500 tons of Coal were carbonized, and the quantity is annually increasing.
For terms and particulars, apply to Messrs. Archer and Son, Solicitors, Ely, Cambridgeshire.

CHELMSFORD GASLIGHT & COKE COMPANY.

THE Directors of the above Company have for immediate DISPOSAL the following, viz.—
One SINGLE-LIFT GASHOLDER, 50 ft. 6 in. diameter, complete with Cast-Iron Columns (Six in number, each 22 ft. 3 in. high), Girders, Guides, Pulleys, and Inlet and Outlet Connections, Valves, &c.
One CAST-IRON TANK and GASHOLDER. Tank, 32 feet diameter, by 17 ft. 6 in. deep. Gasholder, 30 feet diameter. Complete, with Columns (Five in number), Guides, Pulleys, and Inlet and Outlet Connections, Valves, &c.
One 6-inch GOVERNOR, complete with Inlet and Outlet Connections, Valves, &c.
51 WROUGHT-IRON RETORT-LIDS, Oval, 19 in. by 14 in.
32 WROUGHT-IRON SCREWS for ditto.
Sealed tenders, endorsed "Tender," to be sent in not later than Dec. 30, 1891.
Any further information may be had of the undersigned on application.
E. G. Smithard, Engineer.
Gas-Works, Chelmsford, Dec. 9, 1891.

GLASGOW CORPORATION GAS.

TENDERS FOR GASHOLDER.

THE Gas Committee of the Glasgow Corporation are prepared to receive TENDERS for the construction of a GASHOLDER, 236 feet in diameter, at their Temple Gas-Works, near Maryhill.
Copies of Specification and Form of Tender may be obtained and Plans seen at the Engineers' Office, 45, John Street, on payment of Two guineas.
Sealed offers, marked "Tender for Gasholder," to be lodged with the subscriber, on or before the 22nd of December next.
The Committee do not bind themselves to accept the lowest or any tender.
J. D. Marwick, Town Clerk.
City Chambers, George Square, Glasgow, Nov. 25, 1891.

BOROUGH OF WEST BROMWICH.
(Gas Department.)

THE Gas Committee invite Tenders, accompanied with Drawings and Specifications, for the construction and erection of a TWO-LIFT GASHOLDER, 120 feet diameter, at their Gas-Works, Albion, West Bromwich.
A copy of the general conditions and other information may be obtained upon application to Mr. Wm. Littlewood, the Manager of the Gas-Works.
Tenders, endorsed "Tender for Gasholder," to be delivered to me not later than Thursday, Jan. 7 next.
The Gas Committee do not bind themselves to accept the lowest or any tender.
By order, Thos. Hudson, Secretary.
Secretary's Office, West Bromwich, Nov. 21, 1891.

COZE'S Automatic Apparatus for CHARGING AND DISCHARGING GAS-RETORTS. For Illustrated Advertisement of this System, see p. 1106.
Inquiries should be addressed to The Automatic Coal-Gas Retort Company, Limited, 86-88a, Leadenhall Street, E.C.

OIL for the "Wells" or "Lucigen" Lamps.
Hardman and Co., Miles Platting, Manchester.

BOROUGH OF BURTON-UPON-TRENT.

FIRE-CLAY GOODS.

THE Mayor, Aldermen, and Burgesses of the Borough of Burton-upon-Trent, acting by the Council, invite TENDERS for the supply of the FIRE-CLAY RETORTS, BRICKS, and CLAY, required at the Gas-Works during the Year 1892.
Full particulars of the Specification and Conditions, with Form of Tender, may be obtained on application to the undersigned, to whom sealed tenders, endorsed "Fire-Clay Goods" must be delivered on or before Tuesday, the 22nd day of December inst.
The lowest or any tender will not necessarily be accepted.
F. L. Ramsden, Manager and Engineer.
Gas-Works, Burton upon-Trent, Dec. 1, 1891.

COUNTY BOROUGH OF HALIFAX.

THE Gas-Works Committee of the Halifax Corporation are prepared to receive TENDERS for the supply of WET and DRY GAS-METERS during the next Twelve months.
Forms of Tender, and further information, may be obtained on application to Mr. Thomas Holgate, F.C.S., Gas-Works, Halifax.
Tenders, endorsed "Meters," to be sent to the undersigned, on or before Wednesday, the 23rd of December, 1891.
By order, Keighley Walton, Town Cler
Town Hall, Halifax, Dec. 11, 1891.

GASHOLDER.

THE Directors of the Swadlincote Gas Company, Limited, invite TENDERS from competent persons for the construction and erection of a TWO-LIFT TELESCOPIC GASHOLDER, to hold 90,000 cubic feet of Gas.
The Drawings and Specifications may be inspected, and quantities supplied, on application at the Gas-Works, Swadlincote.
Sealed tenders, endorsed "Gasholder," and addressed to R. C. Staley, Esq., Chairman, are to be delivered on or before the 7th day of January next.
The Directors do not bind themselves to accept the lowest or any tender; nor will they pay any charge or expense relating to the making or delivery of the same.
Robert Cartwright, Secretary.
Gas-Works, Swadlincote, December, 1891.

TO RETORT AND FIRE-BRICK MANUFACTURERS.

THE Corporation of Birkenhead are prepared to receive TENDERS for RETORTS, FIRE-BRICKS, BLOCKS, and FIRE-CLAY required at their Gas-Works during the current year.
Forms of Tender may be obtained from Mr. T. O Paterson, C.E., Gas Engineer, Gas-Works, Thomas Street.
Tenders, sealed, and endorsed "Tender for Retorts, &c.," to be sent in to me not later than Saturday, the 26th of December, 1891.
The Corporation do not bind themselves to accept the lowest or any tender.
By order, Alfred Gill, Town Clerk.
Town Hall, Birkenhead, Dec. 12, 1891.

NOW READY. PRICE ONE GUINEA.

PRECEDENTS IN PRIVATE BILL LEGISLATION AFFECTING GAS & WATER UNDERTAKINGS. 1879-1890.

Compiled by EDMUND HERBERT STEVENSON, M. Inst. C. E., F. S. I., and EDWARD KYNASTON BURSTAL, M. Inst. C. E., M. Inst. Mech. E.

This Work (which is a continuation of that published in 1879 by the late Mr. G. W. Stevenson) contains information as to the practice of Parliament during the past twelve years, in regard to most of the points on which differences arise in Opposed Bills for Gas and Water Undertakings. The geatest care has been taken in its compilation; and it is arranged in a very handy form.

***The Work by the late Mr. G. W. Stevenson is still on sale, price One Guinea.

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RETORTS AND FIRE-BRICKS.

THE Directors of the Rochester, Chatham, and Strood Gaslight Company are prepared to receive TENDERS for the supply of 800 feet run of CLAY RETORTS, 20,000 FIRE-BRICKS, and 60 tons of CLAY, according to Specification and Form of Tender, which may be had on application at their Office, 58, High Street, Rochester, where tenders must be delivered before noon of Thursday, the 31st of December, 1891.

WILLIAM SYMS,
Secretary and Engineer.

Dec. 12, 1891.

THE Sandwich Gas Company are prepared to receive TENDERS for the supply of—

One 4-horse power Vertical "OTTO" GAS-ENGINE, with Water-Tank and Fly-Wheel and 9-inch Pulley attached.
One 2000 cubic feet per hour BEALE'S GAS-EXHAUSTER, with 9-inch Pulley attached.
Two 3-inch DISC-FLANGED VALVES.
One 3-inch Self-Acting BYE-PASS FLANGED VALVE.
One 15-inch GAS-GOVERNOR and flanged Throttle-Valve.
8 ft. 2 in. of SHAFTING.
Three 2-inch PLUMMER BLOCKS fitted to Shafting.
Two 15-inch PULLEYS fitted to Shafting.

The above are to be delivered to the Sandwich Railway Station.

Tenders to be sent in, addressed to the Chairman, not later than Jan. 12, 1892.

The Company do not bind themselves to accept the lowest or any tender.

Any further particulars can be had from

JOSEPH LATCHFORD,
Manager.

Sandwich, Kent,
Dec. 9, 1891.

By order of the Executors of the late J. J. Stevens, Esq.—465 £10 shares in the West Kent Gas Company, and 84 £10 shares in the Mitcham and Wimbledon District Gaslight Company, both paying 10 per cent. Dividends; all fully paid and first issue, in numerous lots.

MESSRS. BROAD AND WILTSHIRE will SELL BY AUCTION, at the Mart, Tokenhouse Yard, E.C., on Friday, Dec. 18, 1891, at Two o'clock precisely, 465 FULLY-PAID £10 SHARES in the West Kent Gas Company, the Works of which are situate at Erith and Crayford in Kent; also 84 FULLY-PAID £10 SHARES in the Mitcham and Wimbledon District Gaslight Company, whose Works are at Mitcham.

Both Companies pay Dividends of 10 per cent. They supply large and rapidly increasing Districts; and their Shares may be considered as offering to the public a thoroughly sound investment.

Particulars at the MART; of J. J. KEILY, Esq., Solicitor, 356, GOSWELL ROAD, E.C.; or of the AUCTIONEERS, 7, Queen Street, CHEAPSIDE, E.C.

THE INSTITUTE OF SECRETARIES.

NOTICE.

THE Provisional Council will meet on Dec. 19, for the first ELECTION OF CANDIDATES for Fellowship.

Entrance Fee, £2 2s.; but no Entrance Fee is payable by Members applying before Dec. 31, 1891.

Annual Subscription for Fellows, £2 2s. The Subscription now payable shall cover the year 1892.

Members incur no liability beyond the amount of their Subscriptions.

By order of the Council,
J. A. KELMAN,
TH. BROWN,
Hon. Secretaries.

57, Old Broad Street, E.C.,
Dec. 10, 1891.

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The first issue of the "DIRECTORY OF CONTRACTORS" contains Complete and Authentic Lists of: Railway, Dock, Canal, Harbour, and Pier Contractors, Tramway Contractors, Dredging Contractors, Water-Works Contractors, Gas-Works Contractors, Road and Drainage Contractors, Builders (Contracting), Contractors' Plant Merchants, &c., Railway Engineers, Dock and Harbour Engineers, Tramway Engineers, Water-Works Engineers, Gas-Works Engineers, County Surveyors, Borough and Local Board Surveyors, Public Works under Construction, Bills in Parliament, and other information of value

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MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Inventions may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.

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SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

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Special Derbyshire GANNISTER BRICKS.

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THE SILICA FIRE-BRICK COMPANY,
OUGHTIBRIDGE near SHEFFIELD,
MANUFACTURE
SILICA BLOCKS,
BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY,
Strongly recommended where EXCESSIVE HEATS have to be maintained.

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10,000,000 GALLONS
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CAN BE SUPPLIED DAILY TO
ANY PART OF LONDON,
WITHIN A FEW MONTHS.

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Gas Companies are solicited to try Samples of the
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Prices and Analysis on application.
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LANEMARK CANNEL
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Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for
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Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candle
Coke per ton	1,301·88 lbs.

EAST PONTOP
GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

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COAL OWNERS, NEWCASTLE-ON-TYNE,
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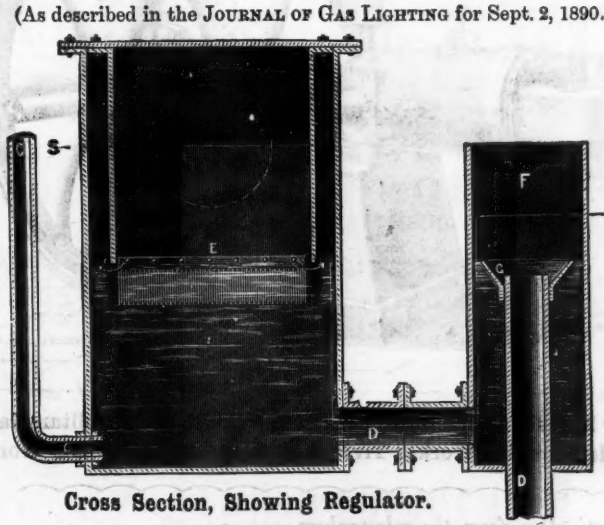

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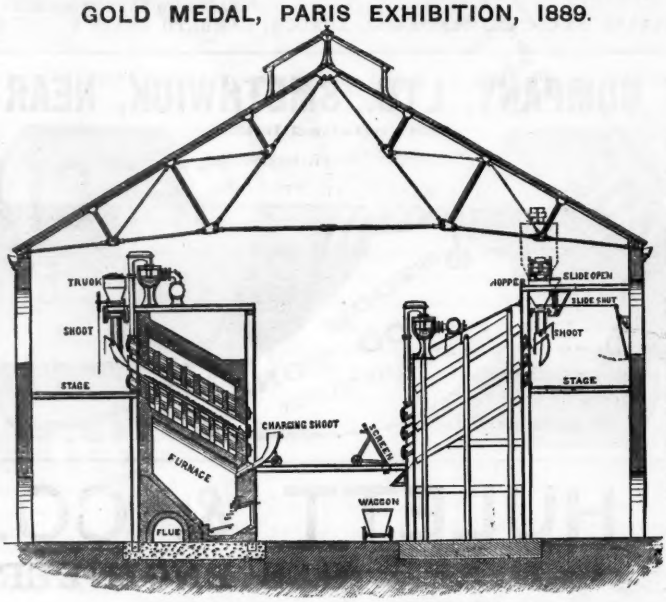

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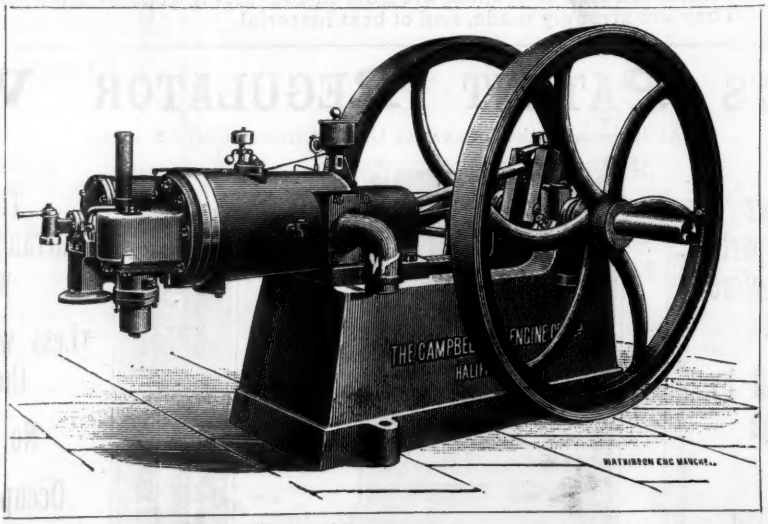

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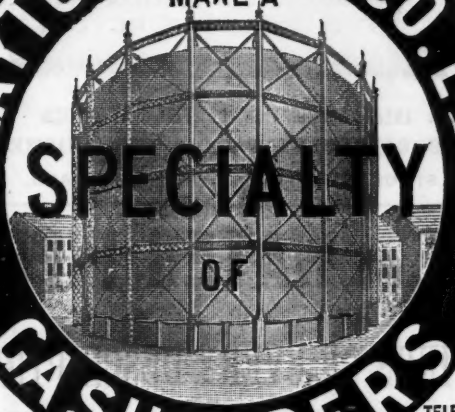

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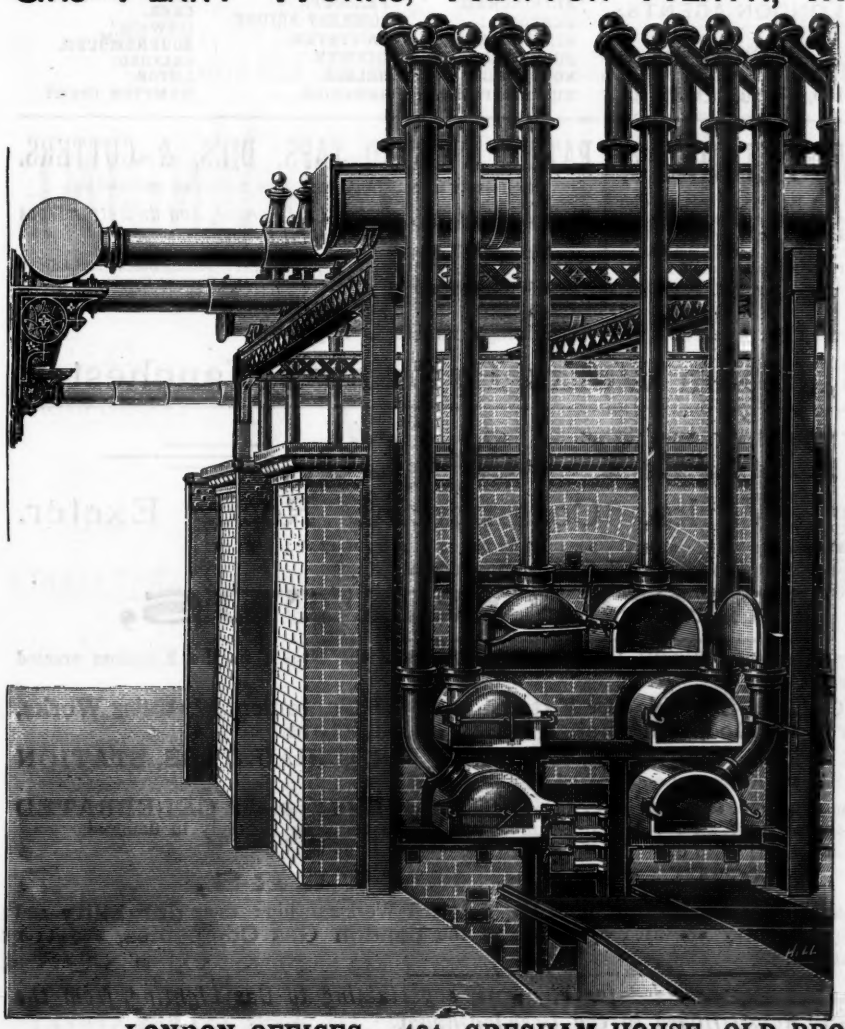

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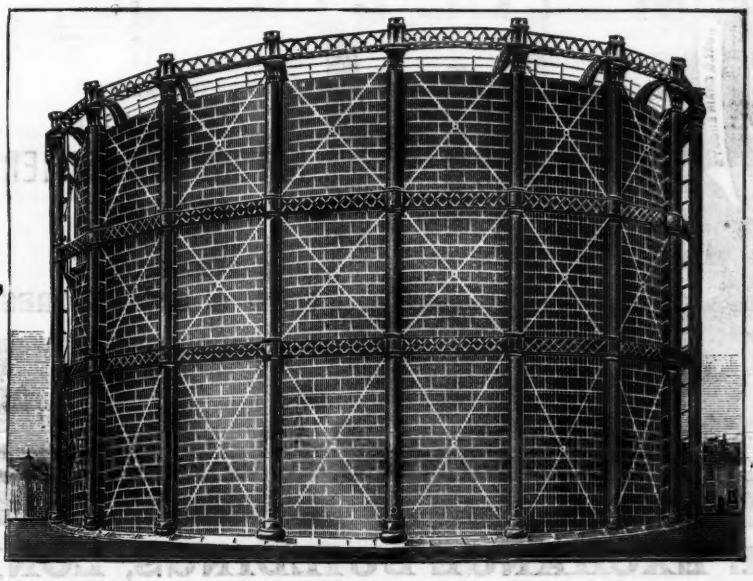

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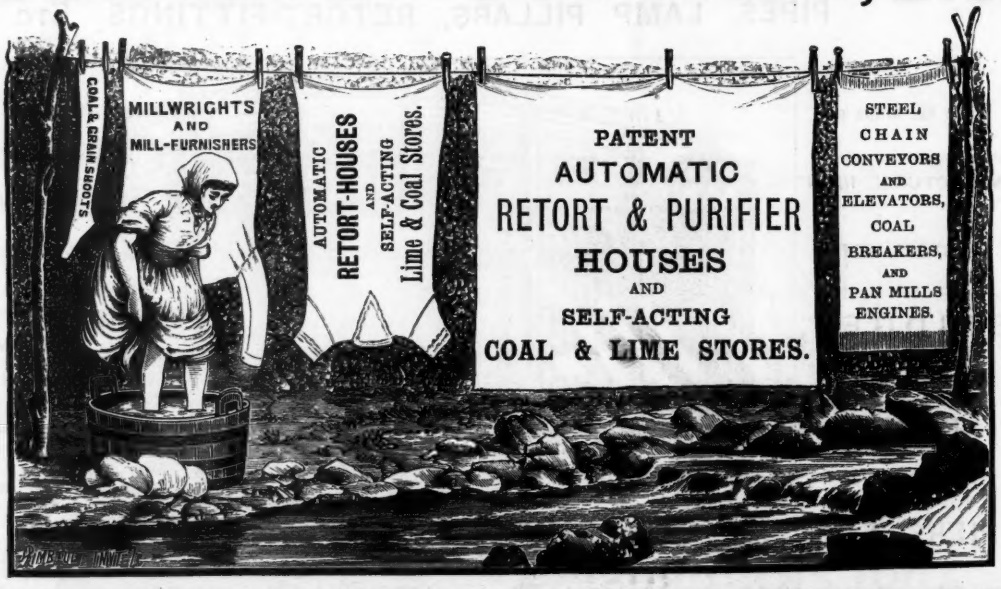
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